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THE NATIONAL GEOGRAPHIC MAGAZINE

FEBRUARY, 1910

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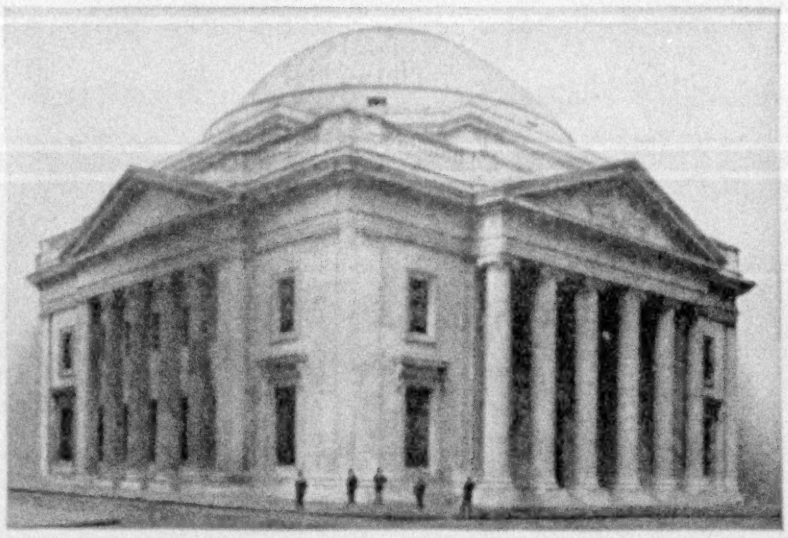

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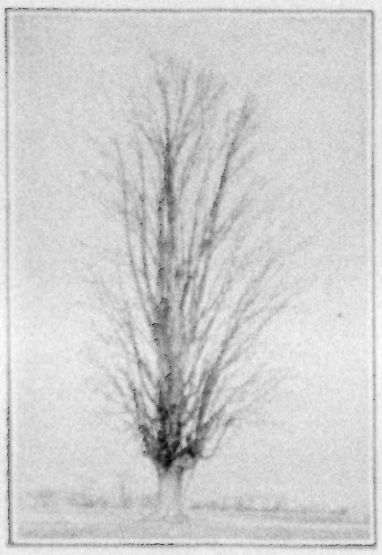

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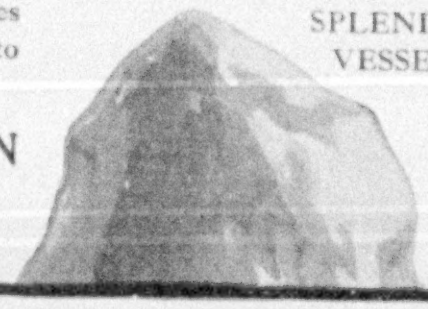

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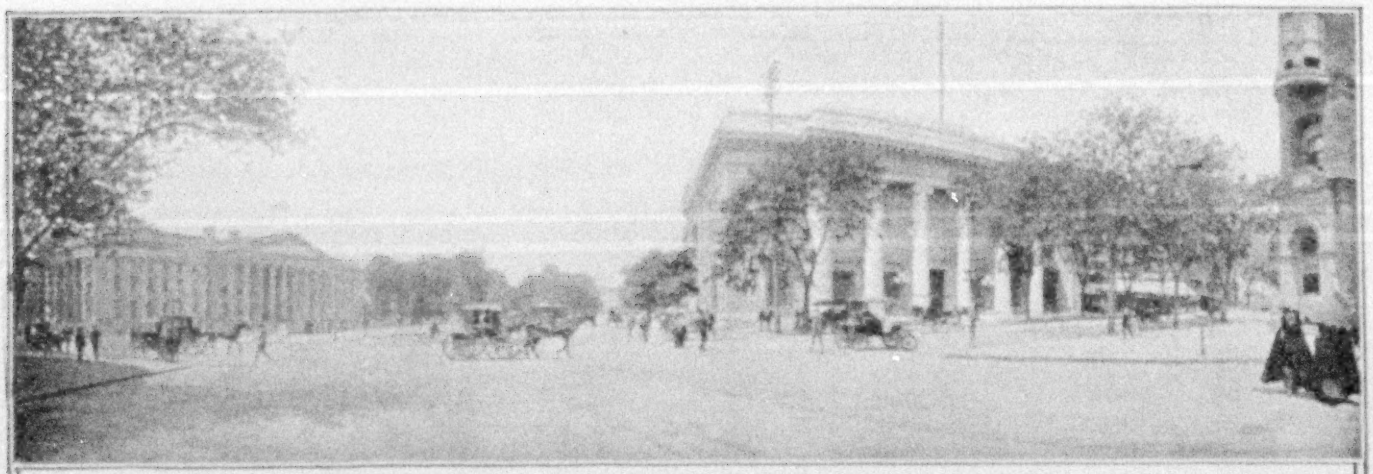

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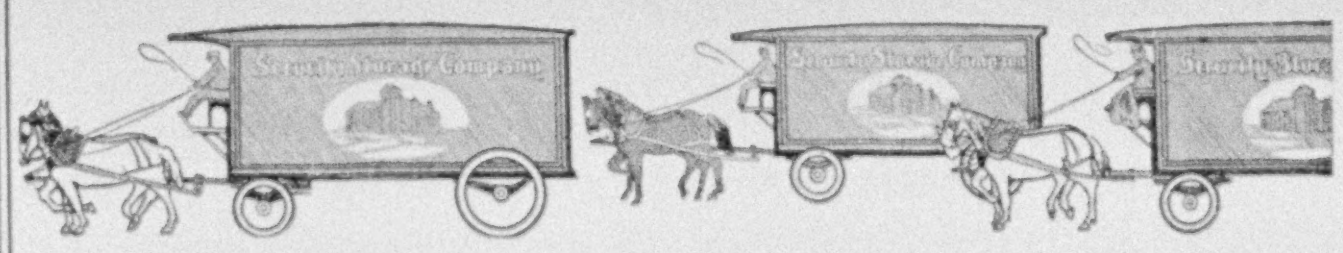

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VOL. XXI, NO. 2 WASHINGTON FEBRUARY, 1910

THE NATIONAL GEOGRAPHIC MAGAZINE

A TRAVELER'S NOTES ON JAVA

BY HENRY G. BRYANT

THE island of Java, in the Dutch East Indies, by reason of the rich beauty of its tropical scenery, its picturesque native races, its varied history, and world-famous archeological remains, deserves attention from the intelligent traveler as a region worthy of special investigation. The writer, recalling how vague his own ideas were concerning Java before his visit to the island, and believing that few have had occasion to acquire special information relating to it, submits these random notes of a journey recently made to that fascinating region.

At the risk of trying the reader's patience somewhat, a few general facts relating to Java are submitted by way of introduction to the general narrative of the journey.

This favored isle lies wholly within nine degrees of the equator and equals in area the State of New York. Its surface is diversified by many lofty mountains, and it is remarkable for the great number of volcanic peaks which rise from the lowlands of the interior. No less than forty-five volcanoes are found on the island, and these range from 2,000 to over 11,000 feet in height, and many of them are constantly in a state of semi-activity. Within historic times several districts have been devastated by these explosive forces, while many will recall the eruption of Krakatoa, in the Strait of Sunda, in 1883, as one of the most desolating disasters of modern times. One result of this ceaseless activity of the forces of vulcanism during past ages has had the effect of covering the greater portion of the island with a thick layer of volcanic material which has produced a soil unequaled in the world for fertility.

This deep, rich soil supports a vegetation which, in luxuriance and variety, is unsurpassed by that of any other region of similar area, and ever since the Dutch established their first settlement on the island, in 1595, a golden harvest of agricultural products has been yearly garnered to swell the granaries of the colonists and the revenues of the home government.

To the visiting American perhaps one of the most noticeable features about Java is the distinctly paternal character of the Dutch colonial administration. This was impressed on us on our first landing at Batavia, where we had to report directly to the chief of police to obtain permits to travel on the island. Before these were granted, full answers had to be given as to our names, nation-

ality, occupation, age, and purpose in visiting Java. During our subsequent wanderings we were obliged to hold these permits in readiness for inspection by officials, and at all times we felt that our movements were a matter of some interest to the authorities. We are not surprised, therefore, to learn that the uniform policy of the government has been, in former years, to discourage foreign travel in Netherlands-India, and the present regulations are only a concession to the modern spirit which demands free intercourse among the nations.

NEARLY ALL LAND OWNED BY DUTCH GOVERNMENT

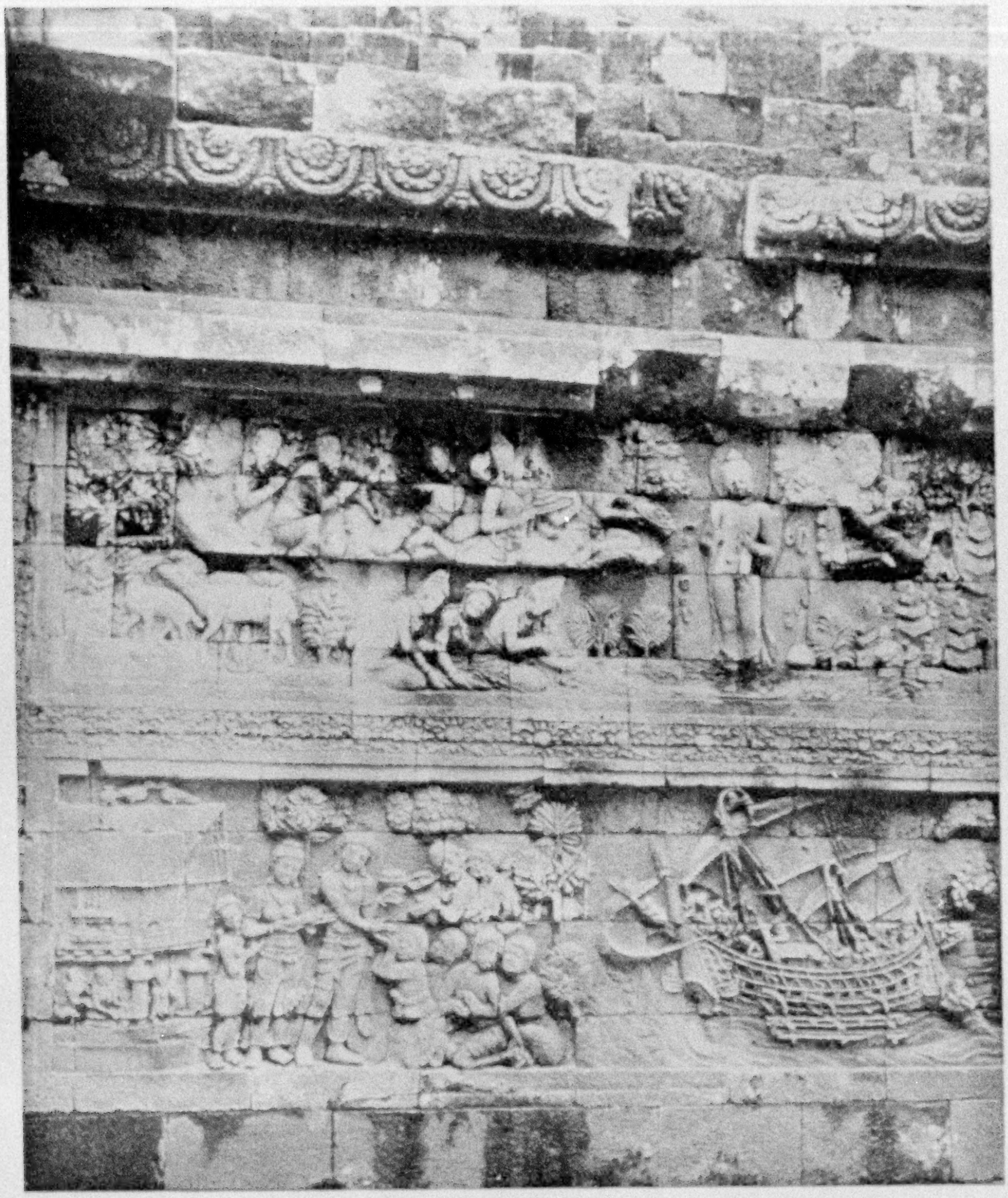
To one who hails from a country where private initiative counts for so much, it is something of a shock to learn that nearly all the land is owned by the government. In securing from the native princes by treaty and purchase the lordship of the land, the Dutch government also inherited the right to receive one-fifth of the produce and the labor of the peasant. This led to the introduction, in the year 1832, of what is known as the "culture system." This was a device to increase the revenues, and consisted in the exaction of forced labor from the peasants, who were compelled, under official supervision, to cultivate tobacco, coffee, sugar, tea, and indigo for their masters. This system of forced labor has been greatly modified in recent years, and I was informed that it now survives only in connection with the government coffee plantations. To most of us, doubtless, the one agricultural product of Java which is best known is coffee. It was something in the way of a disillusion to learn, therefore, that the famous "Government Java" of bygone days is of much less importance as a product of the colony than formerly. A destructive "blight" visited many of the plantations some years since. Some districts have not yet recovered from this, and in the meantime the coffee planters of Brazil have captured the bulk of the world's coffee trade.

While the richest of the Dutch East Indies, Java is also the most densely populated; the number of inhabitants amounts to as many as nine hundred per square mile in some districts. Aside from the sprinkling of Europeans and Chinese, the native population numbers 29,000,000. These all belong to the Malay race and almost without exception profess the religion of Islam.

The early culture of Java can be traced to India, and there is no doubt that this Hindoo influence had the greatest effect on the religion, language, and literature of the island. At the present time this influence is evidenced not only in the language and arts of the country, but by the great temples erected to Buddha. One of these, known as "Great Buddha," or "Boro Boedoer," is by many considered to be the greatest monument of Buddhistic architecture in existence. The Arab Mohammedan invasion occurred in the latter part of the fifteenth century, and when the Dutch began to extend their settlements, in the early decades of the seventeenth century, they found the faith of Islam extended to most parts of the island.

For the purposes of government, the island is divided into 22 residencies under the control of a Governor General, who lives in Buitenzorg. Each province has its Resident, who is assisted by various subordinates. In their dealings with the natives the Dutch find it expedient to collect the taxes and administer the government through an army of native officials. Thus native princes fill the office of regent in some of the provinces and "play" at ruling, but all real power rests with the foreign rulers, who are called "elder brothers."

Lying so close to the equator, the climate is a trying one to Europeans, although the style of dress in use and the manner of life do much to mitigate it. The rainy season lasts from October to April, and at all times showers may be expected. Residents urged upon us the importance of avoiding the direct rays of the sun during the heat of the day. One soon learns that Java is a country of early rising. The ordinary business



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ONE OF THE 988 BAS-RELIEFS OF THE TEMPLE AT BORO BOEDOER (SEE PAGE 104)

man has finished his coffee and is at his shop or office by 6 a. m. Between 9 and 4 o'clock all Europeans endeavor to keep indoors. The midday meal is taken between 1 and 2, and fashionable society does not bestir itself until after 5 o'clock, when driving and visiting is in order until 8 or 9 o'clock, when dinner is served.

Our sail of less than 48 hours over a tropical sea from Singapore to Batavia, the capital city of Java, is full of interest and mystery. Many of the passengers were expecting to cross the equator for

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ON THE WAY TO THE PAPANDAJAN VOLCANO

CUTTING RICE (SEE PAGE 107)

the first time on this voyage, and the captain promised to blow the whistle at the moment our vessel was supposed to cross the imaginary line. After dinner that first evening at sea, we hurried on deck to witness a sunset of rare beauty. As the clouds lifted, we beheld the great orb drop into the sea in a blaze of color whose tints changed even as we gazed on them. We had learned that a partial eclipse of the moon was to occur during the evening, and, to escape the heat below, as well as to see this phenomenon, all hands remained on deck. Presently the mysterious shadow darkened the face of "the bright regent of the sky," and, later on (at 8:15), just as the shadow reached its greatest extent, the ship's whistle sounded on the still air. A strange mingling of sensations, truly, when we gazed on one of nature's marvelous spectacles and at the same time realized that we were entering a new hemisphere, wherein the bright constellation of the Southern Cross beckoned us on to explore new lands and strange peoples.

All next day we sailed southwest, with the great island of Sumatra in plain view to the westward, and, late in the afternoon, entered Banka Strait, keeping on our port quarter Banka Island, so famous for its tin mines.

BATAVIA, THE CAPITAL OF JAVA

Early next morning we docked at Tandjong Priok, the port of Batavia. A swarm of native runners and porters boarded the steamer, directly the gangplank was in place, and such a jabbering and shouting I have not heard since the old days at Atlantic City, before silence was enjoined on the hack drivers.

Our present purpose in visiting Batavia was merely to secure permits to travel, and presently to trans-ship in another steamer to the eastern end of the island. After a short ride in the railway we arrived at Batavia, where we drove at once to the police headquarters for the permits.

The preliminaries attending the securing of permits to travel proceeded with true Dutch deliberation. After answering all the categories of the official, it transpired that the printed forms used for such purposes were all exhausted; hence it became necessary for the clerk to write out by hand the entire document. In due time the necessary credential was obtained, and we then undertook a drive about the city. The ancient city of Batavia proper is a grim, time-worn place, with many warehouses and government buildings grouped amid the intersecting canals. It is said to be unhealthy, and is wholly given over to commercial interests. Delaying here only for a brief survey, we continued our drive on clean, well-kept roads for two miles along canals suggesting Holland to the modern residential suburb of Weltevreden.

Passing under a white arch, we paused a moment to examine the two statues of fierce-looking native gods which guarded the portal, observing also a guard of Javanese soldiers who are being drilled by a native officer. Continuing our drive, we soon arrive at a broad avenue facing the Konigsplein, a great green parade ground, with its bordering streets shaded by rows of tamarind trees. Facing this extensive park are numerous neat villas built in the bungalow style, often embowered in cool foliage, the homes of active and retired officials, army officers, planters, and business and professional men who go to make up the white population of the capital. We soon come to an imposing building of classical design, which proves to be the Museum of the Batavian Society of Arts and Sciences. The copper elephant on a pedestal in front of the building was a gift from the King of Siam, presented on the occasion of his visit some years ago. This museum contains the finest ethnological collection of any institution in the Far East, and its publications rank well among the learned societies of Europe and America.

But the rising sun warns us of the approach of noon and we turn down a side street and soon reach the welcome coolness of the Hotel der Nederlanden. As a rule the hotels were found to be

XUM

A SUNDANESE GIRL

BEATING RICE FROM THE EAR

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A DUTCH GENTLEMAN AND HIS NATIVE WIFE AND DAUGHTERS

PEDDLERS OF SARONGS, THE NATIVE GARMENT
(SEE PAGE 101)

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JAVANESE GENTLEMEN, SHOWING CONTRASTS OF DRESS (SEE PAGE 101)

clean, well kept, and admirably designed to meet the requirements of a tropical climate. They usually consist of a main building openly constructed, so as to admit the passing breeze, with wings containing the sleeping-rooms. The charges in Java are much cheaper than in other parts of the East.

THE RICE-TABLE

Here I made acquaintance with that famous gastronomic institution of Java

known as the Rijst-tafel or rice-table. Seated in a spacious pavilion, an army of beturbaned Malays brought us soup. Then large, deep plates were placed before us in which a supply of rice was deposited. On top of this basic stratum two inches deep we were expected to place an extraordinary variety of vegetables, curries, dried fish, eggs, fowls, and meats flavored with a variety of peppery condiments. After depositing on my plate eight of the dishes offered, limitations of appetite and space demanded a halt, and the remaining half of the sixteen varieties were allowed to pass untouched. Subsequent experience with this rice-table—so fearfully and wonderfully made—taught me discretion; but I shall never forget the bewildering dismay of that first encounter. In this connection, a recent writer remarks that "it is humanly impossible to partake of the rice-table and not to grossly overeat one's self." Perhaps in this daily over-indulgence in the pleasures of the tables we may find the explanation of the fact that the great majority of resident Hollanders are inclined to corpulence.

In the cool of the afternoon we returned to Tandjong Priok and boarded a vessel of the Royal Packet Company's fleet, which sailed the same evening for Soerabaya. A sail of 36 hours brought us to this city, the most important seaport in Java, with a good harbor at the mouth of the Solo River. We anchored off shore and soon after, embarking in one of the native boats, made our way amid the crowded shipping to the landing stage and passed the customs without delay.

Although commercially of great importance, Soerabaya is hot and presents few attractions to the visitor. We observed an air of bustling activity in the streets which seemed to verify the city's reputation for alertness and ascendency in the mechanical arts.

Turning our backs on Soerabaya, a two hours' ride on the railway, through a densely tropical region, brought us to Pasourouan, where we entered the curious carts of the country, called *dos-à-dos*, bound for the delightful mountain resort of Tosari. Ever ascending, we advanced past miles of rice and sugar fields to a pretty little hotel on the lower slopes of the mountain range, where we lunched. The remainder of the climb to Tosari was too steep for vehicles, so horses and palanquins were used for the final stage of the journey. The entire excursion was full of interest, taking us through different climatic zones, each exhibiting their characteristic growths in wild profusion. While two of us were advancing ahead of the main party we surprised a large black ape, which was walking in the road. He viewed us with interest for a moment and then disappeared into the forest.

With a feeling of intense satisfaction we arrived at this delightful sanitarium, where a sojourn of several days in the salubrious air of the mountains gave us renewed strength for our travels in the lowlands.

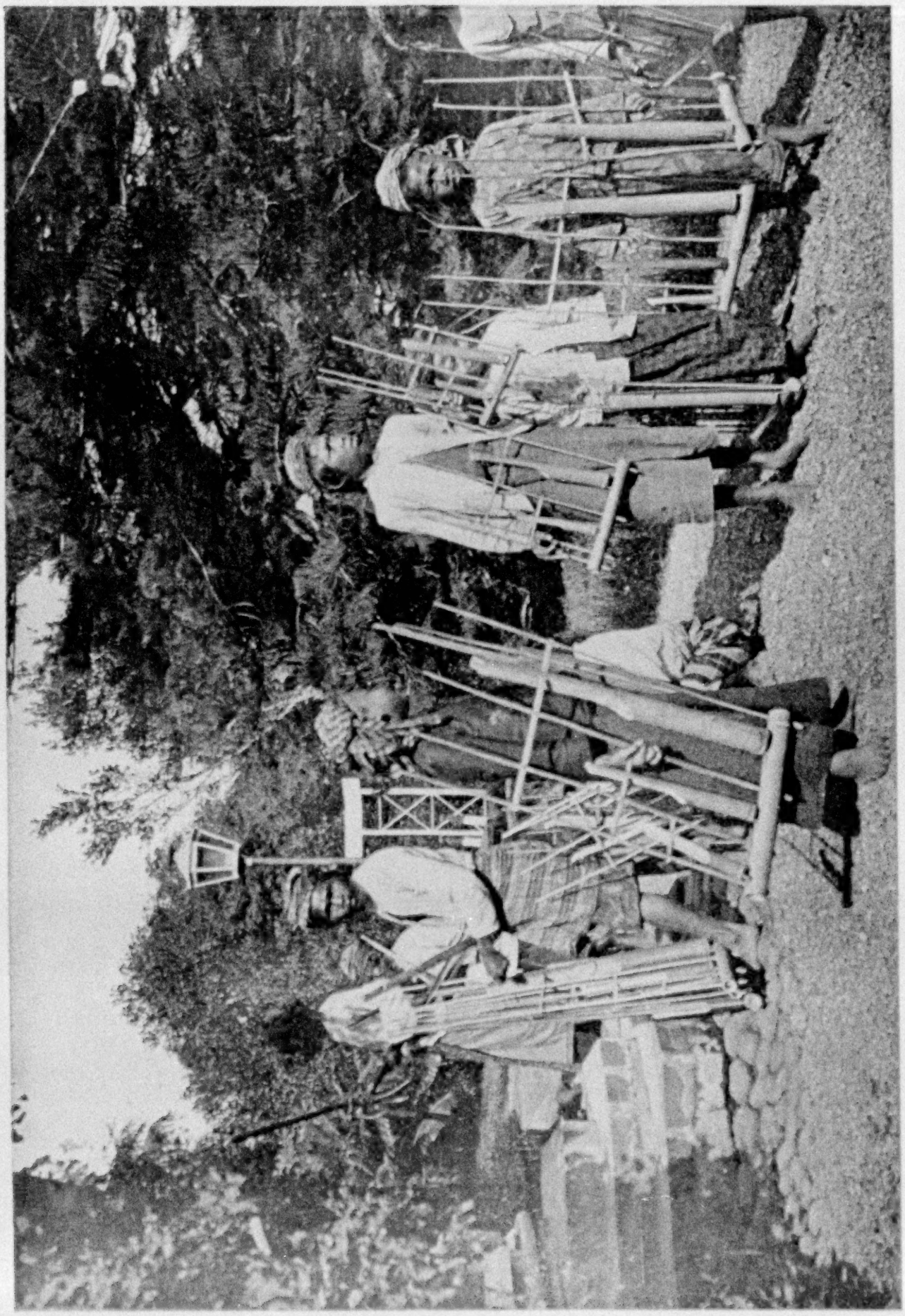
A walk along the single street of the village gave us some idea of the mode of life of these mountaineers, who are quite distinct from their neighbors of the lower valleys. Here are found the homes of the Tenggerese, that hardy tribe who, at the time of the Moslem invasion, retreated to these mountain strongholds and successfully defended their homes against the invaders.

The lofty location of Tosari, perched on a flank of the Tengger *massif* at an elevation of 5,480 feet above sea-level, invites one, by its invigorating air, to undertake walking trips and mountaineering excursions, which in other parts of the island would be out of the question.

Two of these jaunts which abide in memory as among the choicest of Javanese experiences were the trips to the crater of the active Bromo volcano and another early morning climb to the summit of Penandjaän, a loftier eminence which commands an extensive view of the eastern part of the island.

IN THE HEART OF OLD JAVA

With pleasant memories of our mountain sojourn, we discard our heavier



BOY MUSICIANS WITH BAMBOO INSTRUMENTS

Photo by H. G. Bryant

clothing and descend to the plains, and, delaying only one night in Soerabaya, take the government railway and in five hours arrive at Soerakarta, or Solo. This is the seat of one of the two great native princes, called the Soesoehoenan, who receives a handsome annuity from the government and is allowed to pose as ruler over four or five hundred thousand people. Here we are in the heart of old Java, where it is possible to see the native life of the people as it existed centuries ago. Owing to the good offices of the Resident, we were allowed to inspect the Kraton, the great wall-encircled compound of the reigning prince. Accompanied by a Dutch official, the morning after our arrival we drove to the palace. This is built in the center of an area surrounded by walls four miles in extent. An army of over ten thousand servants and pensioners live within the Kraton. At the entrance to the inner palace we were met by the brother of the Soesoehoenan, an agreeable gentleman, dressed in a jacket of European cut, but wearing the universal sarong about his lower limbs. The sash which held this in place contained a jeweled kris or dagger, the weapon which is worn by all persons of any position in this part of Java.

Under his guidance we visited the royal stables and carriage-house, the spacious audience hall and zoological garden, and partook of lunch in the upper room of the clock tower, which commanded a fine view of the enclosure. Here a great variety of food and drink was offered to us by numerous native servants, all presented to us in the servile, squatting attitude assumed in the presence of royalty. Descending, we resumed the rounds of the palace, and everywhere encountered an army of officials and servants. Presently a middle-aged woman, dressed in the careless garb of the country, separated herself from a group of retainers and, walking up to the prince, shook his hand with great assurance of manner. We were informed by our European friends that she was the chief woman official of the palace, for the time being in undress costume. With her frouzy, gray hair, and a great ball of tobacco protruding from her lips, this Javanese mistress of the robes made anything but a courtly appearance.

Thanking our kindly host, we returned to our hotel and, later in the day, went shopping in the busy streets of the town. From a Chinese merchant we secured a number of krises or small swords, said to be of ancient date, but with wooden handles which had a suspiciously modern appearance. Here as elsewhere a number of women peddlers brought to the hotel samples of the artistic cloths from which the sarongs or skirts of the Javanese are made.

STYLES OF DRESS

The universal style of dress consists of the sarong and kabaya. "The kabaya is a sort of dressing jacket, often embroidered. Under it is worn the sarong, a brightly colored skirt falling down straight and narrow, with one simple, deep fold in front, and kept in place by a silk scarf wound around the waist several times."

Here in Solo the old and the new in dress are often found in startling contrasts. At the court festivals held here it is possible to see groups of Javanese nobles, some in the modified European attire and others in the ancient court dress of the country. During our stay we were invited to an evening reception, given by the prime minister of the Sultan, and all the native men present as guests wore the modified European costume. At least once a year the prince gives a great entertainment, when he dispenses a truly royal hospitality. Hundreds of natives and Europeans are invited to the festival, and the best actors and dancers are engaged. After one of these entertainments it is said all sorts of tableware and bric-à-brac are offered for sale in the city—a result of the wholesale thefts on the part of the servants, who seldom receive any pay and take this means to "get even." It is said some one remonstrated with the Soesoehoenan for permitting this condition of affairs to

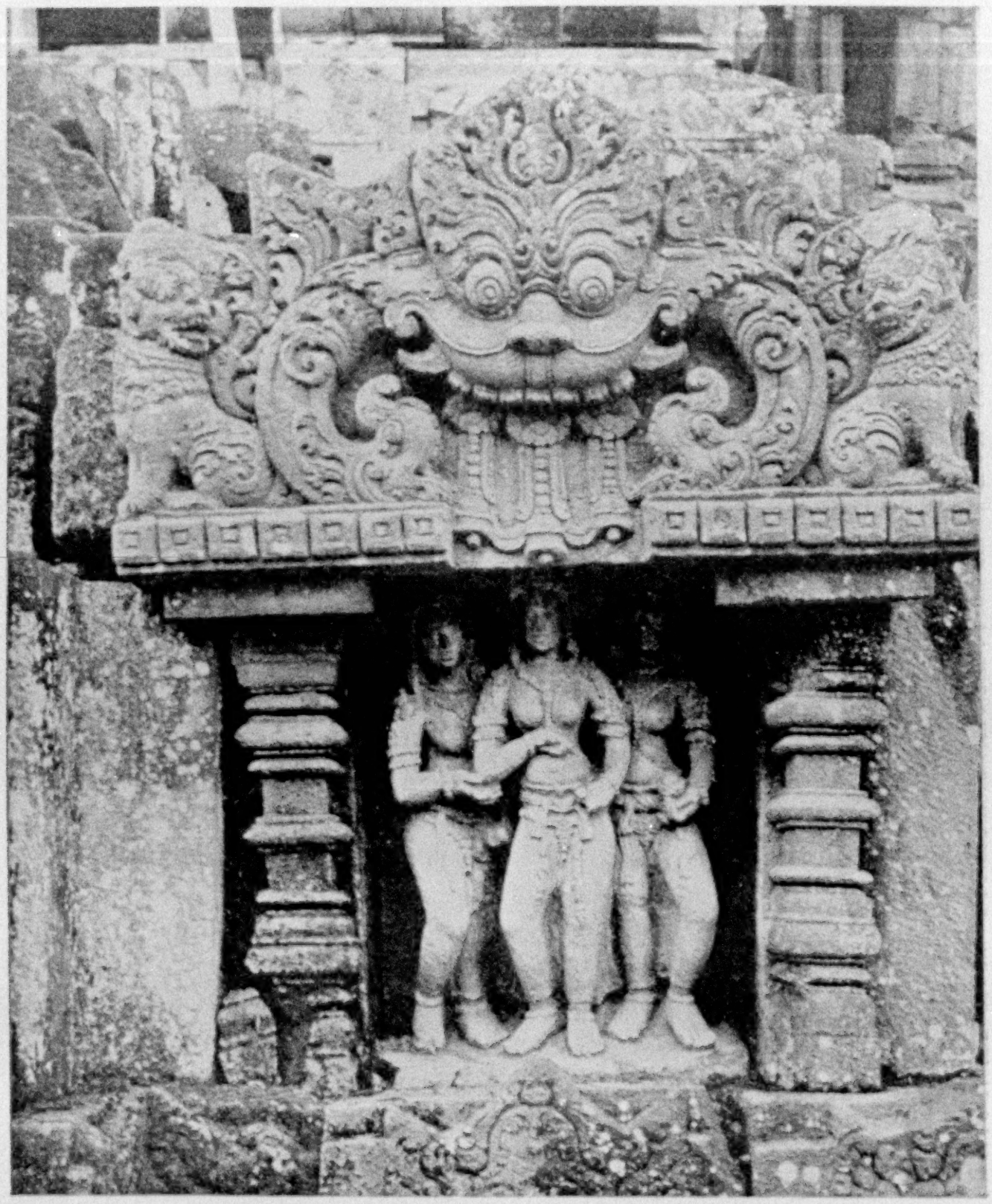


Photo and Copyright by C. H. Graves

"THE THREE GRACES": BRAMBANAM

exist, and he is said to have answered: "Who can my people steal from if they cannot steal from me?"

THE RUINS OF BRAMBANAM

From Solo we made an interesting excursion to the ruins of the temples at Brambanam, which are believed to date from the ninth century and form eloquent monuments of the grandeur of the period of Hindu dominion in Java.

We first visited what remains of the temples dedicated to Lara Jonggran, known in India as the Goddess Durga.

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RUINS OF CENTRAL TEMPLE: BRAMBANAM

Passing the remains of three circular walls, we arrive at the inner area which embraces the ruins of eight pyramidal structures. One of these contains, in one of its four compartments, the eight-armed bronze figure of the goddess which gives the temple its name. A broken statue of her consort, Siva, stands in the inner chamber of this temple, while in the western chamber sits a striking image of Ganesha, the elephant-headed god of wisdom. The images in another temple, dedicated to Siva, are especially notable for a certain dignity of expression, and

are in the main well preserved. In another group of ruins is found a well-executed representation of three women popularly known as "the three graces."

After an hour's repose in a rest-house near the ruins, we entered carriages drawn by four stout little ponies and sped along over well-kept roads toward Djokjakarta, the seat of the second so-called independent prince. The main roads in this part of Java are lined with noble trees and the ride in the late afternoon was one of pure delight. We passed many villages and marveled at the density of the population and the fertility of the land which nourished all these teeming millions.

JAVANESE DANCERS

Arriving at last at Djokjakarta, we established ourselves at a comfortable hostelry and put in two days in viewing the sights of this historic locality. This was the last citadel of native rule on the island and after the final conquest of this eastern empire, in the Mataram war of 1825, Dutch control of Java became supreme. The present Sultan is nothing but a puppet king; but, with the large annuity paid him, he is able to maintain an outward show of royalty, as is evidenced by a showily-uniformed bodyguard and a small army of native officials.

These people are passionately devoted to the form of dramatic art known as the Wajang Wong, and to the dances given by their Bejadas, or ballet troupes. Some of my readers will doubtless recall having seen the performances of one of these troupes at the Chicago World's Fair. Their dancing is of the measured, serpentine style, with many graceful turns of the hand and postures of the body. No account of Java would be complete without some reference to the Wajang Wong. There are two forms of these plays, one in which leather puppets are employed, and the shadows of these puppets are thrown on a curtain and the talking is done by a man behind the scenes. In the other form of this drama the characters are taken by living persons. In both instances the plays deal with mythological subjects and serve to perpetuate the ancient epics and legends of the people. I attended one of these performances at the house of a rich native. Of the seven actors, four were women, and music was furnished by five performers. The leader of the orchestra recited the words of the archaic drama, modulating his voice according to the character. All the actors wore masks with prominent hawk-like profiles. The action of the play related to the doings of gods and mortals. The masks were of different colors: gold for gods, white for giants or great men, red or black for devils, and brown for Javanese.

THE GLORIES OF BORO BOEDOER

Just after sunrise one morning we started in carriages for the site of the most famous of all the ruins at Boro Boedoer. It was exhilarating to roll along through this region of mid-Java, illustrating the perfection of tropical landscapes. We encountered hundreds of natives hurrying along, carrying their burdens to a near-by pasar or market. On reaching the village of Temple, where the market was held, while the horses were being changed we had an opportunity to observe hundreds of these brown-skinned people trafficking in their farm produce and exchanging the gossip of the neighborhood. Resuming our journey, we would come at intervals upon villages buried away in the shade of dense tropical forests, and whose existence was unsuspected until we arrived in their midst. Here, in his humble home, the happy, care-free native lives close to nature's heart and concerned with nothing but the performance of his share in the cultivation of the village rice-fields.

The glories of Boro Boedoer have been amplified by every traveler who has visited this ancient shrine, and it would take an entire paper to do justice to its many marvels.

I shall quote a short passage from a recent description of the ruin: "The temple, which is believed to have been built during the end of the ninth century, was

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GANESHA, THE ELEPHANT-HEADED GOD; BRAMBANAM

not discovered until the period of English occupation, when it was partly laid bare by the removal of earth and ashes that had been heaped up against it during centuries of eruptions from neighboring volcanoes.

"Of its kind, the temple is probably the largest Buddhistic edifice in the world, its prominent position on the summit of a hill, above which it towers to a height of 120 feet, lending additional dignity to this marvelous pyramid. . . . The temple consists of a number of terraces, built on a square ground plan.

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BODYGUARD OF THE SULTAN OF DJOKAKARTA (SEE PAGE 104)

Stairways lead to the top from each of the four sides. Rising from the summit is a dagoba, which contains a gigantic image of Buddha.

"An idea of the magnitude of the structure may be gained from the fact that there are over 988 bas-reliefs in a good state of preservation, illustrating the life story of Buddha, while 441 images of Buddha, each within a small dagoba or shrine of its own, are still in existence."* The five lower terraces are

*"A Cruise through Eastern Seas," p. 139 (Ed. Stanford, London, 1906).

of square design, while the three upper terraces are circular.

We marveled at the beauty and chasteness of the bas-reliefs, copies of which attracted so much attention at the Paris Exposition of 1900. The latticed dagobas on the upper terraces are said to be quite unusual in design. "The whole is a splendid epitome of Buddhism just before its decline."

After our protracted sojourn in the rich lowlands of mid-Java we were in the humor to enjoy a week's stay in the cooler air of a delightful little resort known as Garoet, situated in a wide valley in the southwestern part of the Preanger district, at an altitude of nearly 2,400 feet above sea-level, and completely surrounded by volcanic peaks.

One of the pleasant features of travel throughout Java was the friendly attitude of the people toward us. Everywhere we were received with smiling faces and treated with courtesy. Every day during our stay at Garoet we were serenaded by a band of youthful musicians, whose instruments were made of bamboo. By an ingenious sliding device, when the position of the instrument was reversed, impact was made upon the cylinder of bamboo; thus each instrument made its individual note, and, among them, they produced the complete octave.

Many charming excursions can be made from Garoet. I shall refer to one which we made to the crater of the volcano of Papandajan, about seventeen miles distant. We had grown accustomed by this time to early starts, and so did not resent being called at half-past three in the morning. An hour later we entered a wagonette-like vehicle drawn by three horses and drove southward over the undulating surface of the valley. The dawn came at length, and we met many peasants on their way to begin their daily toil in the rice-fields.

IN THE RICE-FIELDS

In Java rice is the staff of life, and the energies of the people seem to be devoted more to its culture than to any other industry. On this drive we had an opportunity to see how it is harvested by the natives, who are apparently able to work all day under the burning sun without inconvenience.

Water is an absolute necessity to its successful culture. By a series of irrigating canals it is led to an upper field from which the water is drained from one terrace to another. In fields where the rice had matured we beheld numbers of peasants cutting the stalks with hand scythes in the old, old style which obtained in the days of the patriarchs.

Later the sheaves are bound in neat bundles and piled together in small stacks. The finest grade of rice is said to come from Japan, but Java rice is also highly esteemed in the markets of the world. In this land of dense population and struggle for the mere necessities of life the human animal is the carrier of burdens, and we found many troops of men transporting the rice to the storehouses. While walking about the village one day I met a company of women engaged in the same service—patient creatures performing their allotted tasks without a murmur.

But the sun is already making its presence felt, and we have covered the first eleven miles of our journey and arrived at Tjiseroepan, a quaint village at the base of the volcano, with houses having peculiar, steep roofs of thatch unlike those seen elsewhere. Beyond here it is impossible to go in a vehicle, and one must choose between a mountain pony and a palanquin.

The six-mile trail to the crater leads at first among coffee plantations and past fields of cinchona trees; but soon we leave all signs of cultivation behind and enter a true tropical jungle, where nature seems to run riot in its many forms of beauty. All about us we see examples of tree-ferns with orchids clinging to their trunks, banks of giant lantana bushes, and occasional clusters of the purple trumpet flower of the deadly belladonna plant. Lofty, overarching trees, with huge creepers trailing from their branches, and groves of the graceful bamboo, made a lovely picture. As we

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EUNUCHS IN GROTESQUE COSTUME: DJOKAKARTA

approached the crater plant life became less prolific and finally gave place to a stony waste, where we crossed rivulets of hot, ill-smelling water. At length we dismount and clamber up the last few steps on foot to the rim of the crater. Following our native guide, we descend into the crater and make our way over the treacherous ground, which is very hot in places. We wonder at the stoicism of our guide, who wears no shoes on his feet. We make our way over the

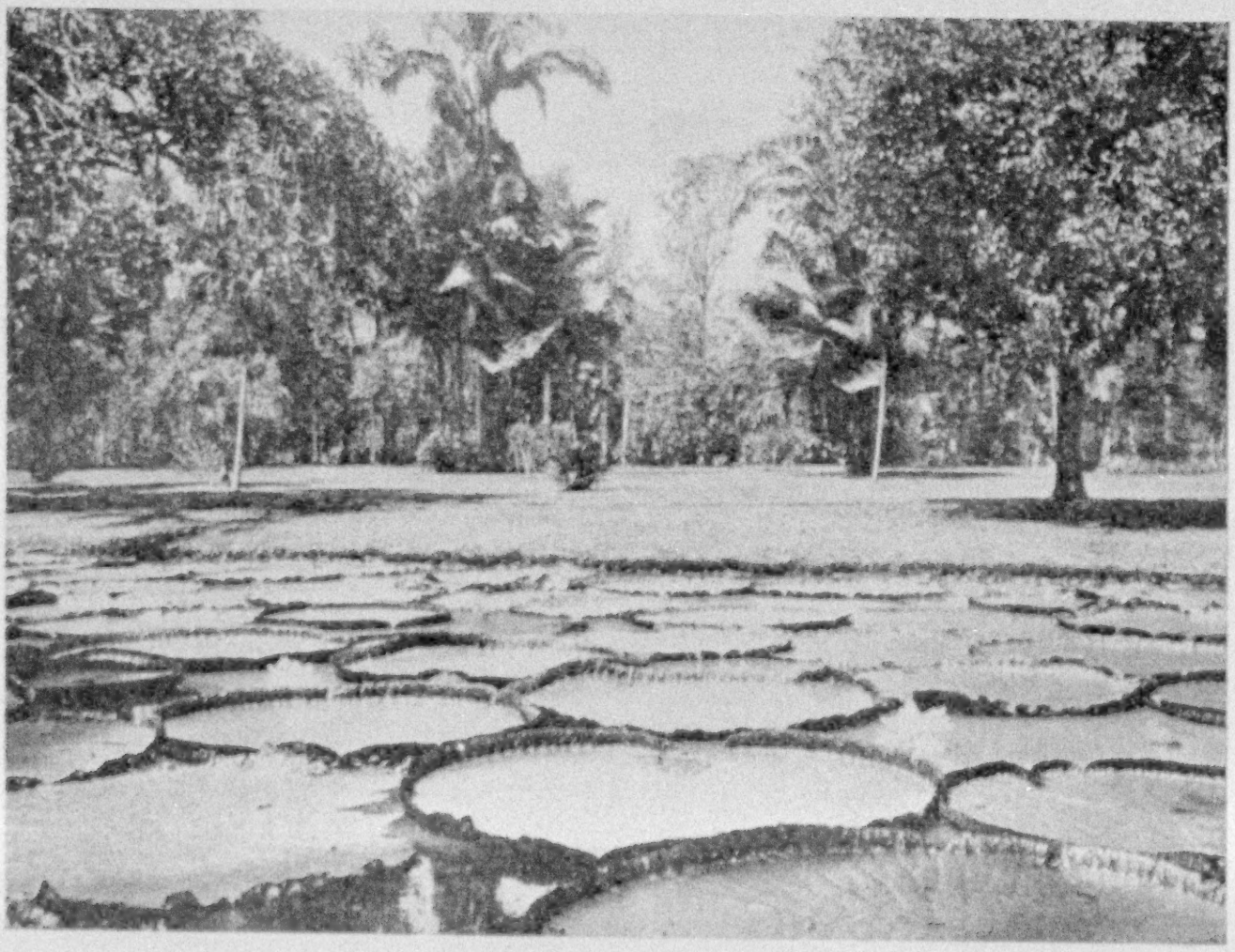
Photo and Copyright by C. H. Graves

GROUP OF DANCERS AT A NATIVE FESTIVAL: DJOKAKARTA (SEE PAGE 104)

broken surface amid hot vapors, past many mud springs and vent holes whence malodorous gases come forth. In a way the place recalls the Devil's Kitchen in the Yellowstone National Park, although the Javanese name Papandajan, meaning "smithy," is just as descriptive in its way.

THE BOTANICAL GARDEN AT BUITENZORG

With many regrets we leave Garoet, with its cool airs and homelike hotel,



WOMEN CARRYING RICE: GAROET Photos by H. G. Bryant

VICTORIA REGIA LILIES: BOTANICAL GARDEN, BUITENZORG

for Buitenzorg, passing on our way the celebrated plain of Leles, which furnishes an example of the elaborate system of land cultivation which prevails in Java.

Buitenzorg ("without care") has a charming situation 870 feet above sea-level, and contains the residence of the Governor General and the famous botanical garden. First impressions count for much, and in this instance the view from our hotel window of the river valley sweeping down from the slopes of Salak mountain was one worth remembering. A short walk brings us to the Botanical Garden, which we enter by a noble avenue of Kanari trees, whose overarching branches form a vault of living green. The garden, which comprises 90 acres, was established by the German naturalist, Reinwardt, in 1817. An annual grant of $50,000 is made by the government for its maintenance.

After visiting other celebrated gardens at Kew, Calcutta, Peradeniya, and the Castleton Gardens, of Jamaica, I cheerfully award the palm of excellence to this one, where man has done much but nature more to develop a veritable paradise of the horticulturist. Wherever one turns charming vistas meet the eye, and we were especially interested in searching out the useful bread-fruit tree and the curious sausage and candle trees. The arrangement of the specimens in family groups adds much to the educational value of the garden.

In the retrospect of travel in this favored isle, the memory of this lovely spot will always stand for what was best "in that enchanted garden men call Java."

AN ANCIENT CAPITAL

By Isabel F. Dodd

Professor of Art and Archeology in the American College for Girls, Constantinople

No archeological discoveries of recent times are more interesting than those made in the last three years of the ancient Hittite civilization in Asia Minor. There are references to the Hittites in the Old Testament (Genesis xxiii, I Kings xi, II Kings vii), but little has been known of them until very recently. The excavations at Boghaz Keouy and elsewhere in Asia Minor prove that the Hittites were a powerful and civilized race who ruled practically all of Asia Minor 4,000 years ago. Hittite warriors overthrew the first Babylonian dynasty about 1800 B. C., and they also checked the victorious advance of the Egyptian kings in Syria and Palestine.

THE traveler who has taken the strenuous journey of eight or more days from Constantinople to Boghaz Keouy will thank his lucky stars that he persevered; that he surmounted the obstacles of bad roads and worse inns and reached that marvelous place.

Of late years the whole reading world has become interested in the Hittites, and, though the sculptures of Boghaz Keouy and the fact that it was an ancient Hittite center have been known for many years, it was not until the excavations were begun there, in 1906, and carried on in 1907, by Professor Winckler and Macridy Bey, that any one realized what a place of wonders it is.

Boghaz Keouy means the "village of the throat," for it is at the end of a deep valley that the modern Turkish village lies, in northern Cappadocia, and the Hittites of the sixteenth and fifteenth

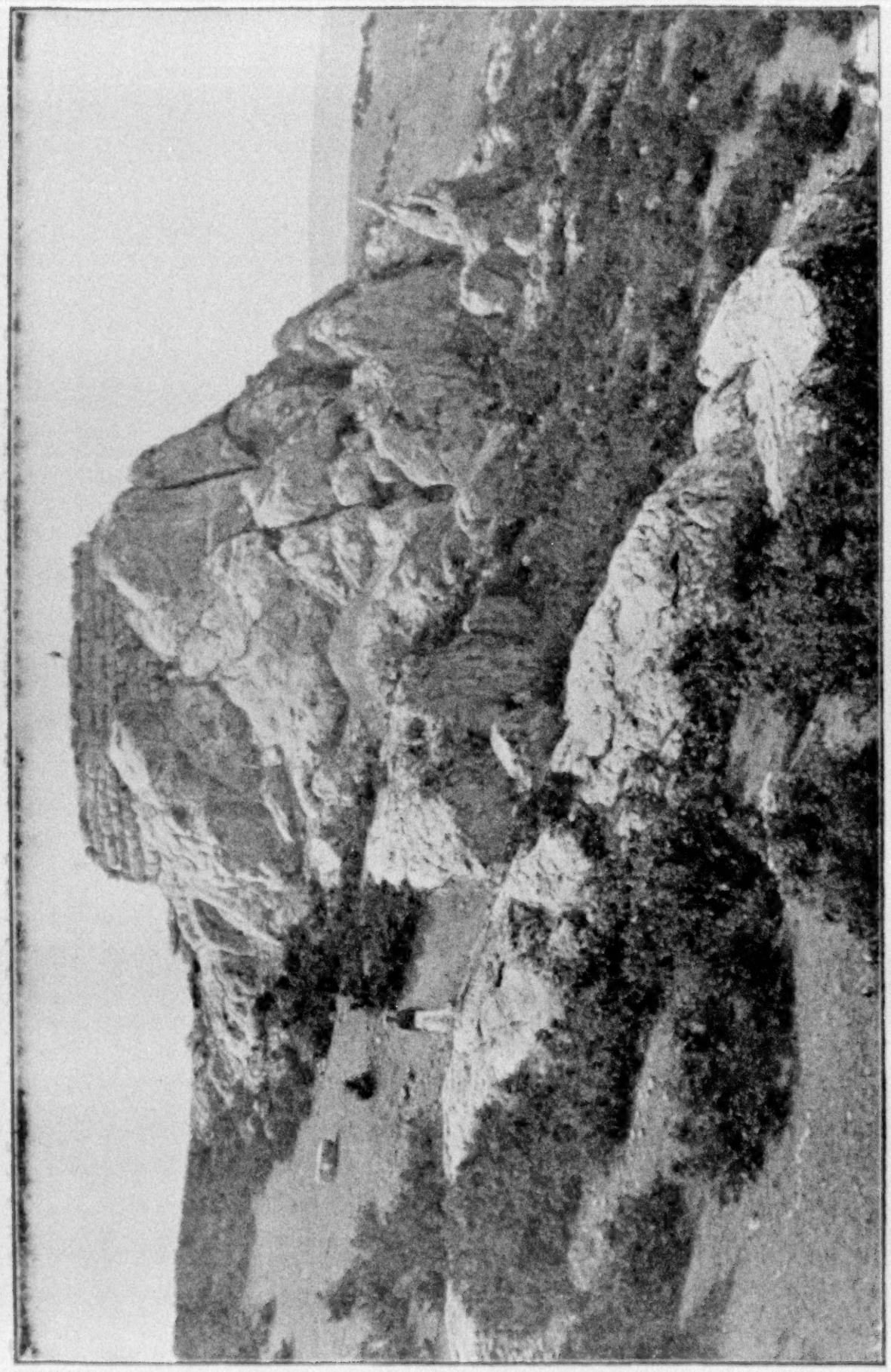


Photo from Smithsonian Institution

THE GREAT CITADEL IN THE CENTER OF BOGHAZ KEOUY (SEE PAGE 113)

centuries B. C. built their great fortified city on the rocky hillsides above the mouth of this valley.

Whether it was Subbi Luliuma or some other musically named gentleman who laid out this city of many great buildings and strong fortifications, he certainly possessed an appreciation of natural beauty as well as statesmanship, for, as one climbs from point to point—from the palace up to the great citadel; from one rock, crowned with massive ruins, to another still more stupendous—one hardly knows which to wonder over and admire more, the strength and skill displayed in these three or four thousand year old remains or the glorious views that greet one's eyes at every turn.

From one corner of the citadel, by the remains of a round tower, you look straight down four or five hundred feet of rock into the gloom of a narrow gorge, at the bottom of which a stream flows darkly, and you can see little but the rock over which you lean, and the swallows that flash in and out of the gorge, and the eagles that sail to their nests on the opposite crags. On another side of the citadel, at the foot of the precipice, the same stream winds softly through trees and grass and flowers, where willows whiten in the breeze and a mill clacks merrily. Here we saw the rare black stork sail proudly through the valley and heard the rock doves cooing in the caves.

On the less steep side of the citadel there have been several trenches dug by the excavators. In the earth thrown out of these trenches some peasants have planted their grain, and thus, fertilizing their seed with Hittite remains, they have raised an abundant crop with little labor.

All over the flat top of this acropolis, as well as everywhere else in the city, one may pick up any quantity of broken pieces of ancient pottery—brown, black, and every shade of red and every degree of fineness. Much of this pottery is painted, most of it with simple decoration resembling that on the proto-Corinthian or geometric vases. Some of it has a beautiful glaze; some is covered with a white slip and painted in three or four colors, while most of it has simply black or dark red markings on red pottery. These pieces are found in the earth below the regular wall of the citadel, as well as above it, thus showing their great age. Here and there are pieces of enormous pithoi, evidently used by the Hittites for storehouses, as by the Greeks.

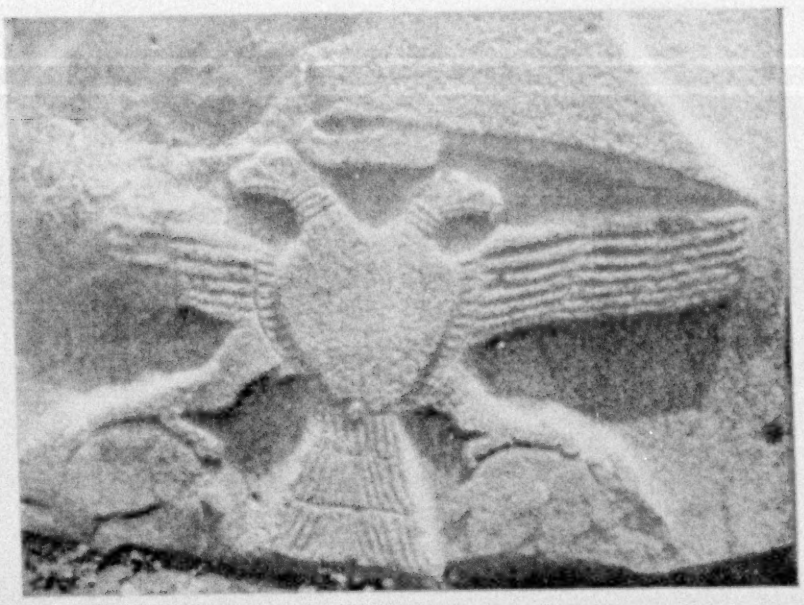


Photo by Isabel F. Dodd

THE HITTITE DOUBLE-HEADED EAGLE

ASSYRIAN CUNEIFORM CLAIMED MORE IMPORTANCE THAN DID LATIN

A visit to Boghaz Keouy not only makes one feel quite intimate with the Hittites, but also one sees here that they did many of the things that we associate with much later peoples. Did the Turks first use the star and crescent; or even the Greeks of ancient Byzantium? No, indeed; here at Boghaz Keouy (and in the later Hittite city, newly excavated, near Aintab, in South Turkey) the star and crescent may be seen where it was carved in the rocks a thousand years before Byzantium was founded.

Did the Austrians or Russians, or the old Byzantines, or the German Empire, first use the double-headed eagle? None of them. Everywhere in Hittite sculptures we find this symbol. The first peo-

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THE EAST GATE, FROM WITHIN (SEE PAGE 116) Photo from Smithsonian Institution

ple, probably, who practised the noble sport of falconry were the Hittites—so the sculptures tell us. And in that connection it was interesting to hear from the Turkish bey, who is the overlord of all this region, that he and his friends train and use falcons in hunting now, and are very eager in the sport.

Was it Rome that first made the proud boast that all roads lead toward her? Professor Ramsay tells us that all the roads of more ancient times met in Boghaz Keouy. Was it only in medieval Europe that there was one writing and language used for general communication between nations, and for learning and literature? Assyrian cuneiform claimed more importance and a greater vogue than did Latin, since for three thousand years and more it was the language of commerce and literature among all the civilized nations of the world. And to these civilized nations belonged the Hittites.

Here on the citadel in 1906 the explorers unearthed a library of clay tablets all written in cuneiform characters, some of them in the Hittite language, but more in the Assyrian. All these tablets have been taken to Constantinople, to the Museum, and are awaiting the reading that will give us, we hope, much new light on the lives and thoughts of the Boghaz Keouy Hittites.

Of the tablets that have been read, one gives the Assyrian text of the treaty between the great Rameses of Egypt and the powerful Hittite king Khattu-Sil—that treaty of which the Egyptian text was already well known to historians.

And another tablet, as Professor Sayce tells us, shows how much women had to do with politics in those far-off days, since it is a letter from Naptere, the wife of Rameses, addressed to the Hittite Queen, and expresses her great satisfaction over the conclusion of the treaty.

In the summer of 1907 another great library was found in two rooms at the eastern side of the palace. Some of these tablets are very large, 12 x 8 inches in size; others are but 2 inches long. They are mostly of about the same time as the Tel el Amarna tablets, and so cover the age of Moses.

Professor Sayce also tells us that many of these Boghaz Keouy tablets were written by the same disaffected governors of Syrian provinces, who, in the Tel el Amarna tablets, write to Pharaoh of the difficulties in the way of maintaining the rights of the Egyptian government in Syria, but tell how nobly they were working in their lord's interests, while in these newly found writings of Boghaz Keouy the same men tell the *Hittite* king how they are pretending to be the humble servants of Egypt while really obeying the commands of Khattu-Sil, and the political intrigues that are here displayed and the polite sarcasm and meaningless phrases that pass between these old writers might give points to modern diplomatists.

NO KEY TO THESE TABLETS HAS YET BEEN FOUND

Although all the tablets discovered two or three years ago were carried to the Constantinople Museum, the shepherds and laborers who wander over these hills pick up occasionally broken pieces of tablets, and, knowing that any writing on clay or stone seems precious in the eyes of "these queer Europeans," they offer what they find for sale to any passer-by. As one eats one's dinner a boy appears, and, squatting on his heels, produces a few bits of clay from his girdle, or wrapped in a handkerchief (which challenges comparison in age and in dirt with the Hittite contents); or one is awakened in the early dawn by a head stuck between the curtains of the tent and an insinuating voice saying "kyramidi" (clay tiles), the owner thereof being anxious to strike a bargain quickly, before he takes his sheep up on the hills above.

So far, I believe, no bilingual has been found among the tablets; that is, no writing which repeats the same thing in both the Hittite and the Assyrian languages, and which would perform the office for the Hittite which the Rosetta stone performed for the Egyptian hieroglyphics. But the sudden stopping of the history

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Photo by Isabel F. Dodd

THE FIGURE OF THE AMAZON ON THE EASTERN GATE

which the tablets tell, as well as the condition of the ruins unearthed, shows us that some time in the thirteenth century B. C. the great city was destroyed, probably by a sweeping down of some barbarian horde, thus anticipating (long ages before) the story of the destruction of Rome. And this Hittite capital was never again inhabited or rebuilt, for there is apparently no trace of Greek or Roman work or influence in the remains. The Hittite power, however, was not destroyed then. Cilicia and the southern part of Cappadocia have numerous monuments which show occupancy by Hittite people till about the eighth century B. C.

What is considered the latest of known Hittite works is the rock sculpture at Ivriz of the god of the harvest and a worshiping king; and this Ivriz, near the Cilician gates, is one of the most beautiful spots in all Asia Minor. The sculptured rock rises above a green dell, through which flows such a mountain stream as fills one's heart with singing. Salmon trout are found in great numbers in its rushing, green waters.

These fish the modern Hittites (and perhaps they learned it from the ancient ones) catch in what any sportsman would declare to be a most iniquitous manner. They use no hook or line, but beat out the juice of a certain milkweed and spread this juice on the water. The trout is intoxicated by it, turns over, and, floating, is picked out by hand. They say that the fish entirely recover in a bowl of fresh water, and that the intoxication does not injure the flesh for food. That the salmon trout caught in this Hittite way taste particularly good I can testify.

The great Ivriz figures by the mountain stream have been known and visited by Europeans for ages, but a replica, much worn and weathered, has lately been discovered two miles farther up a wonderful gorge, where great rocks like those at Boghaz Keouy nearly meet overhead, and here is shown that persistence of sacred traditions about one place which has often been remarked upon, for here also the ruins of three Christian churches cling to the sides of the gorge.

THE AMAZON OF THE EASTERN GATE

As we walk away from the citadel in Boghaz Keouy to see the various points of special interest within the five-mile circuit of the ancient walls, we come first to the one place on this site where there has been found any inscription in the Hittite hieroglyphics (those hieroglyphics which are so common all through the more southern Hittite country). This one inscription of Boghaz Keouy is so badly worn by time and weather that it is quite illegible. Further down the hill slope we come to the Eastern gate. Like the other city entrances, this has two parts, with a square room between the outer and inner gate. The posts of the real door curve in toward the top, as if they once formed a pointed arch. This Eastern gate has long been known and is

THE LION GATE

of grand proportions, but it is only since the archeologists left here, in 1907, that the workmen discovered, almost by accident, on the inner side post, a remarkable bas-relief.

This is a figure, about ten feet high, of an Amazon, apparently, and bears little resemblance to the figures found in other distinctively Hittite places. It is carved in high relief and finished with great care, even to the finger and toe nails and the delicate metal work of the breast-plate. Having been so recently uncovered, the fineness of its workmanship is excellently preserved, and we can trace all the details of the curious headdress, lappets of which fall over each ear and down the back, while the flowing hair shows clearly beneath the long back lappet. This Amazon has a strong, masterful face, and the treatment of the eye, as well as other details of the carving, seem to belong to some later period than the rest of the city. She wears what seems like chain armor over breast and shoulders, and a short skirt ornamented with rows of lines and circles. She carries a double-headed axe in her right hand and has a short sword girded to her side. The strongly accented muscles of her legs look like Assyrian work, and her feet are bare instead of being encased in pointed Hittite shoes.

SECRET PASSAGES AND TUNNELS

We leave this gate and walk over fields and hillocks to where the wall or fortification forms a high bank, rising eighty feet or more from the fields each side. Here there are two interesting mementos of the Hittites—a tunnel through the fortifications and steps up the bank. There are two flights of these steps, made of limestone, about six feet broad, low and easy, varied by occasional platforms. The tunnel is about one hundred and eighty feet long and perhaps ten feet high in the middle. It is formed of unhewn stones of uniform size, and the ceiling is a true pointed arch with keystone. There are a number of such tunnels as this to be found in Boghaz Keouy.

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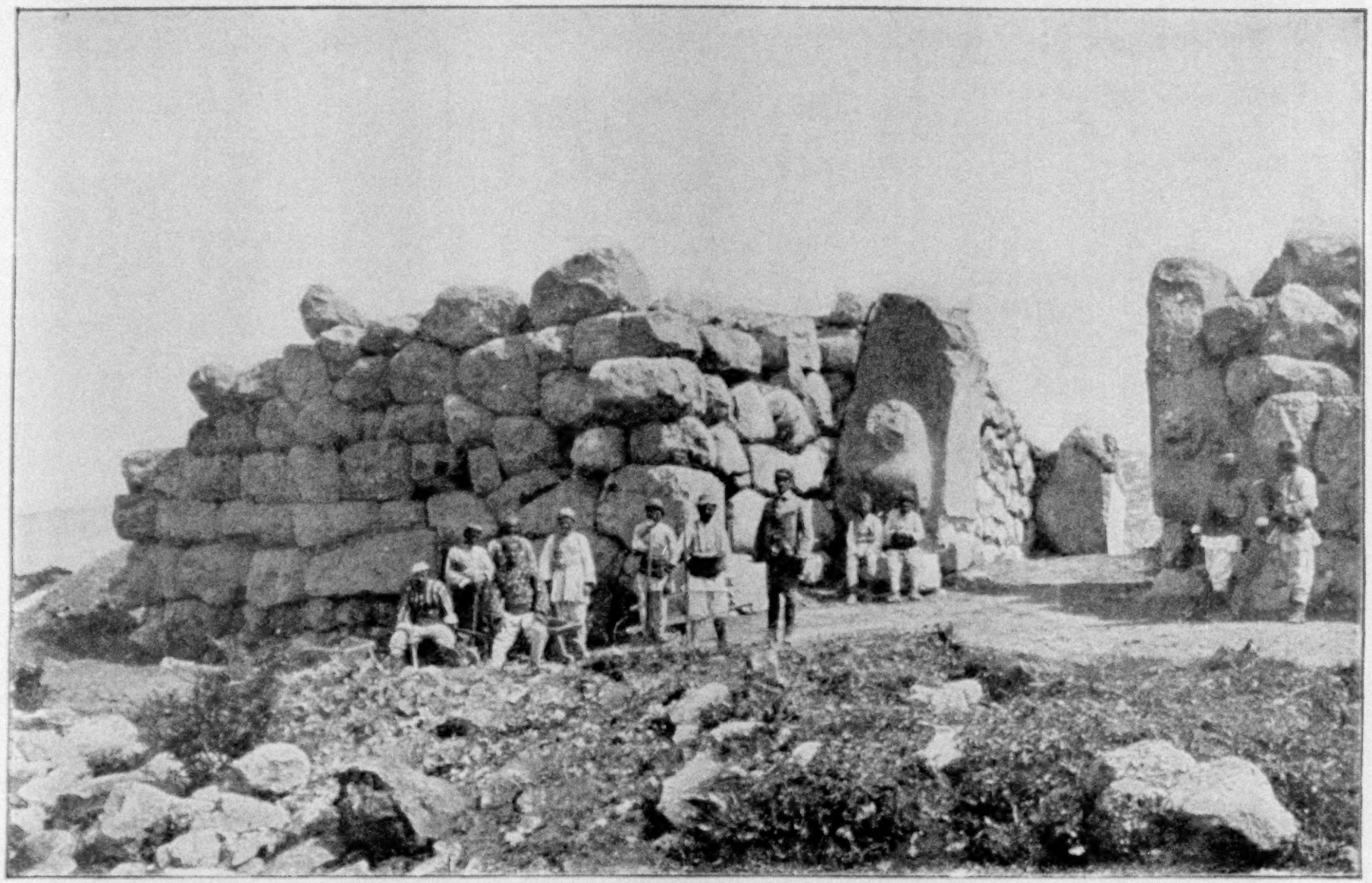
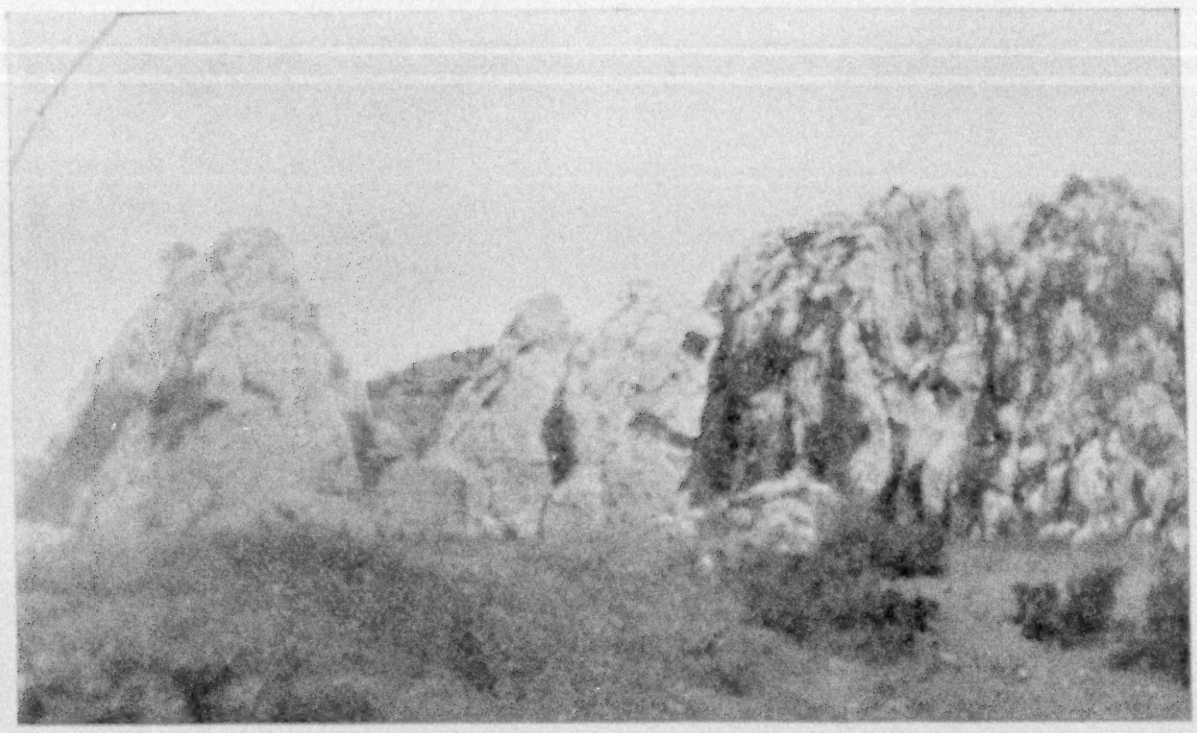


Photo from Smithsonian Institution

ANOTHER VIEW OF THE OUTER SOUTH GATE, WITH LIONS, AND OF THE LEFT TOWER



THE PICTURED ROCKS AT BOGHAZ KEOUY

Of some only the postern appears, and some are filled with débris and can be penetrated but a short distance.

It seems to have been a Hittite habit to build such underground passages, and this habit was continued by their relatives or imitators, the Phrygians. Professor Ramsay tells us of several secret passages connecting different parts of Hittite and Phrygian fortifications, or an acropolis and some more or less distant hill. This tunnel ends on the outside in a post and lintel gate, with grooves for a door and holes for the closing-bar. On the citadel there was one specimen of the ancient Babylonian door-socket, well worn, but worn into a block of limestone squared and cut as perfectly on all sides as if for a modern building.

Once more following the wall, we come to the famous Southern gate, which admitted to the city the commerce and travel from Cilicia, and which is still guarded by the lion posts, always pictured in every description of Boghaz Keouy. Fine, upstanding lions they are, too, with wide-open jaws and curly hair.

From between the lions one looks outward and downward to a marvelous stretch of hill and dale, while on the inside we look across the mile and a quarter of the city limits, sloping down from this point 870 feet to its northern end. Here and there on the slope rise the great rock fortresses, each bearing on its summit more or less of Hittite masonry. Beyond the northern side of the city stretches a wide and fertile plain which must have furnished the greater part of the sustenance of the capital.

THE PALACES

We also see from this gateway, or on the road to it, a number of palaces whose foundations have been uncovered in the course of the excavations. The largest of these lies on the lower part of the slope and is about 208 feet long by 138 feet wide. It consists of a great central hall and many chambers on each side. On the south side and on the southeast corner there seem to have been splendid entrances with double gates, small courts between, and pillars at each corner. The stones which form these courts, and especially the thresholds, are most beautifully worked with a curved and beveled edge. The stone used is largely the limestone of the region, but part of the pavement of the great hall and many other parts of the building were of imported trachyte.

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THE REAPERS IN THE SMALL GALLERY (SEE PAGE 122)

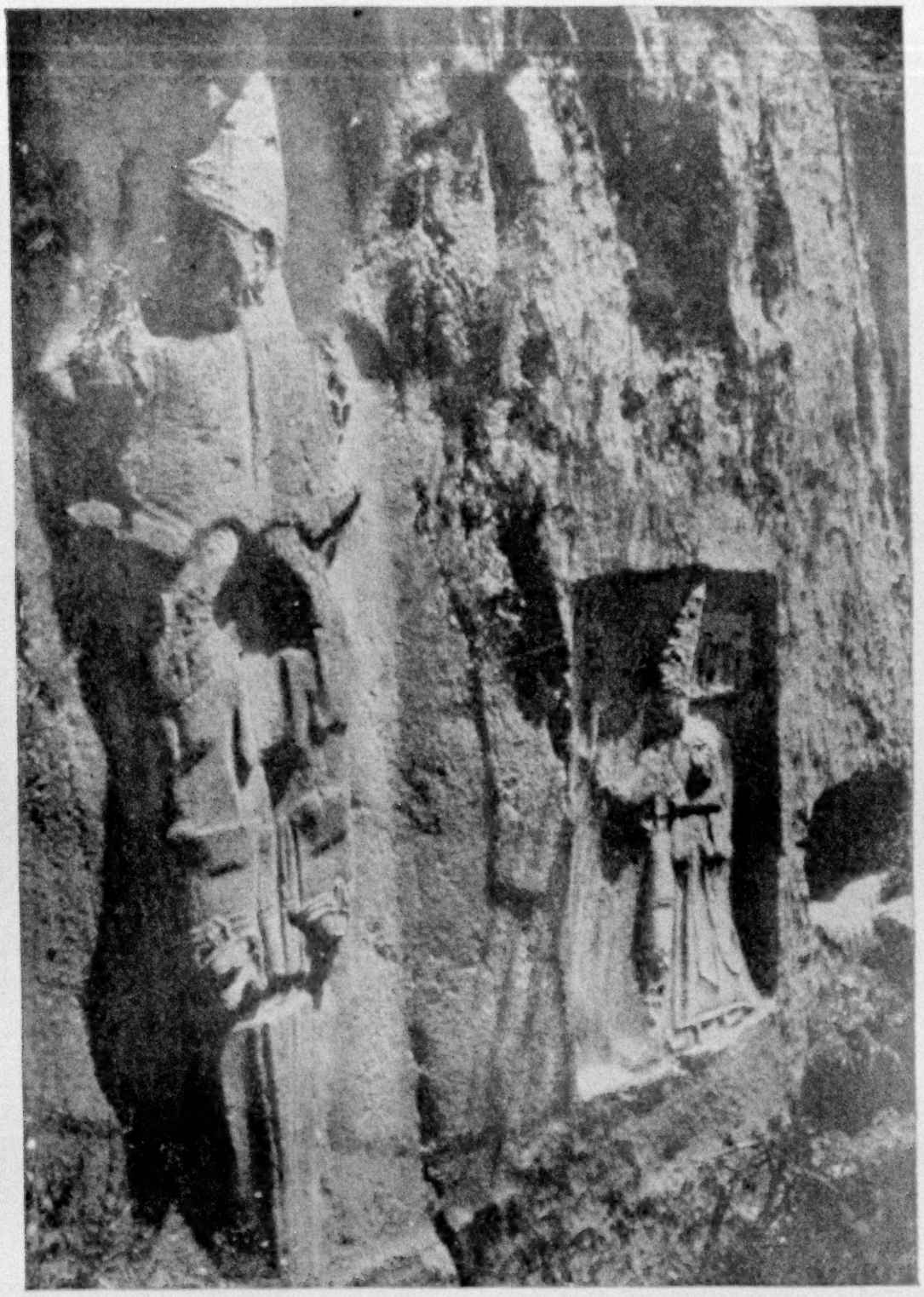
From the lack of any stones which could have formed the upper parts of the building, and from the holes drilled in the upper side of the stones at regular intervals, it has been conjectured that the buildings were of wood, covered within with clay tiles, and were entirely burned at the time of the destruction of the city. This would also be shown by the charred remains found everywhere in the ruins.

One cannot but wonder how the Hittites kept themselves warm in their palaces, what kind of stoves they used, or if they had a central heating plant, and whether it was for hot water or steam. It is a place of very cold winters nowadays. From the great stone bath-tub at one corner of the palace, in a trench, and from the clay receptacle (surely a bath-tub!) in the Hittite room of the Constantinople Museum, we are convinced that the Hittites loved cleanliness.

The lower end of the palace is built upon terraces to correct the slope of the hill. On the northern side, also, is what has been called a sanctuary, a large room with an especial entrance, and what may be an altar, upon one side, while on the other is a small cistern or basin of rock. The Armenian cook of our expedition was inspired by the atmosphere of interest in antiquities, and went over this palace, pacing each room carefully and bringing back in triumph a broken wooden spoon and the lower jaw of a dog. As he displayed his Hittite relics he looked with contempt at the pile of broken potsherds which we had gathered. Crestfallen as he was over the lack of appreciation which greeted his finds, he was later the first to discover some real antiquities. It was the evolution of an archeologist.

NO MORTAR WAS USED ON THESE GREAT BUILDINGS

Time would fail me to tell of all the splendid masonry found on each of the rocky heights of Boghaz Keouy, all made of great stones, one fitted into another by a peculiar sort of curved edge, without mortar. "Yellow Rock" (as it is called) has the most of the building remaining. "Yenije Kaleh" (somewhat new rock) has the most heart-gripping height and extended view. "Storehouse Stone" has many rock-hewn chambers, now used by the shepherds. "Curious



THE LION-BODIED FIGURE IN THE SMALL GALLERY (SEE PAGE 122)

Rock" has a great curved niche hollowed in one side, as though for a colossal statue. Another smaller rock is split in two and has hollows carved all over the top, like old dew-ponds, while at one side is a place with three cut steps just like the altars of Cybele in Phrygia. Still farther down we find "Maiden's Rock," low and flat. No one knows why it is so named. Perhaps the ancient Hittite maidens used it as a dancing floor. Over on the other bank of the river is another great rock with a similar redoubt on its head.

The wall which surrounded the city was of the most solid character; where it remains it is about 14 feet thick, the center a 6-foot core of rubble, while each side is a 4-foot thickness of finely dressed stone.

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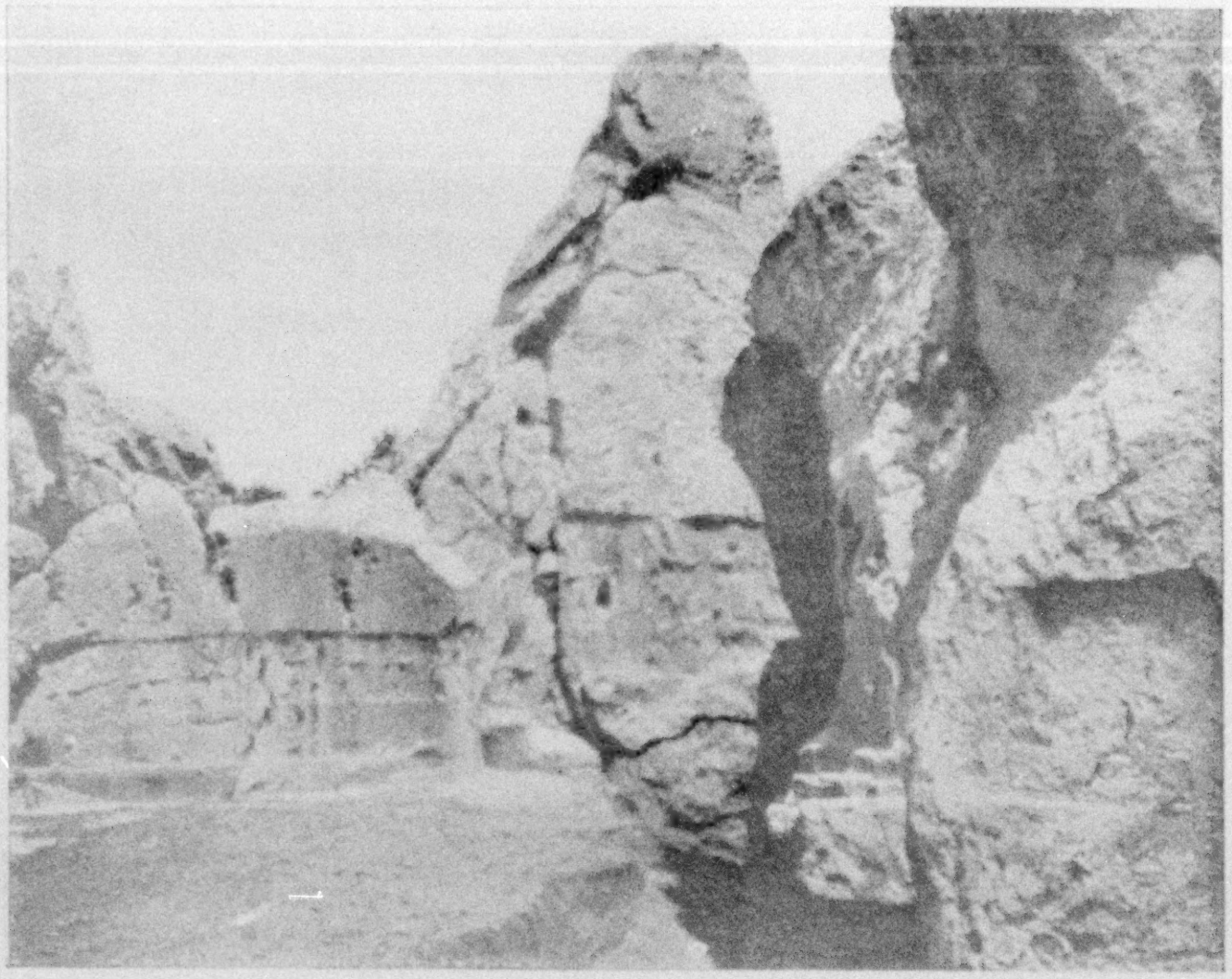


LOOKING TOWARD THE NORTH IN THE GREAT GALLERY AT BOGHAZ KEOUY

THE PICTURED ROCKS

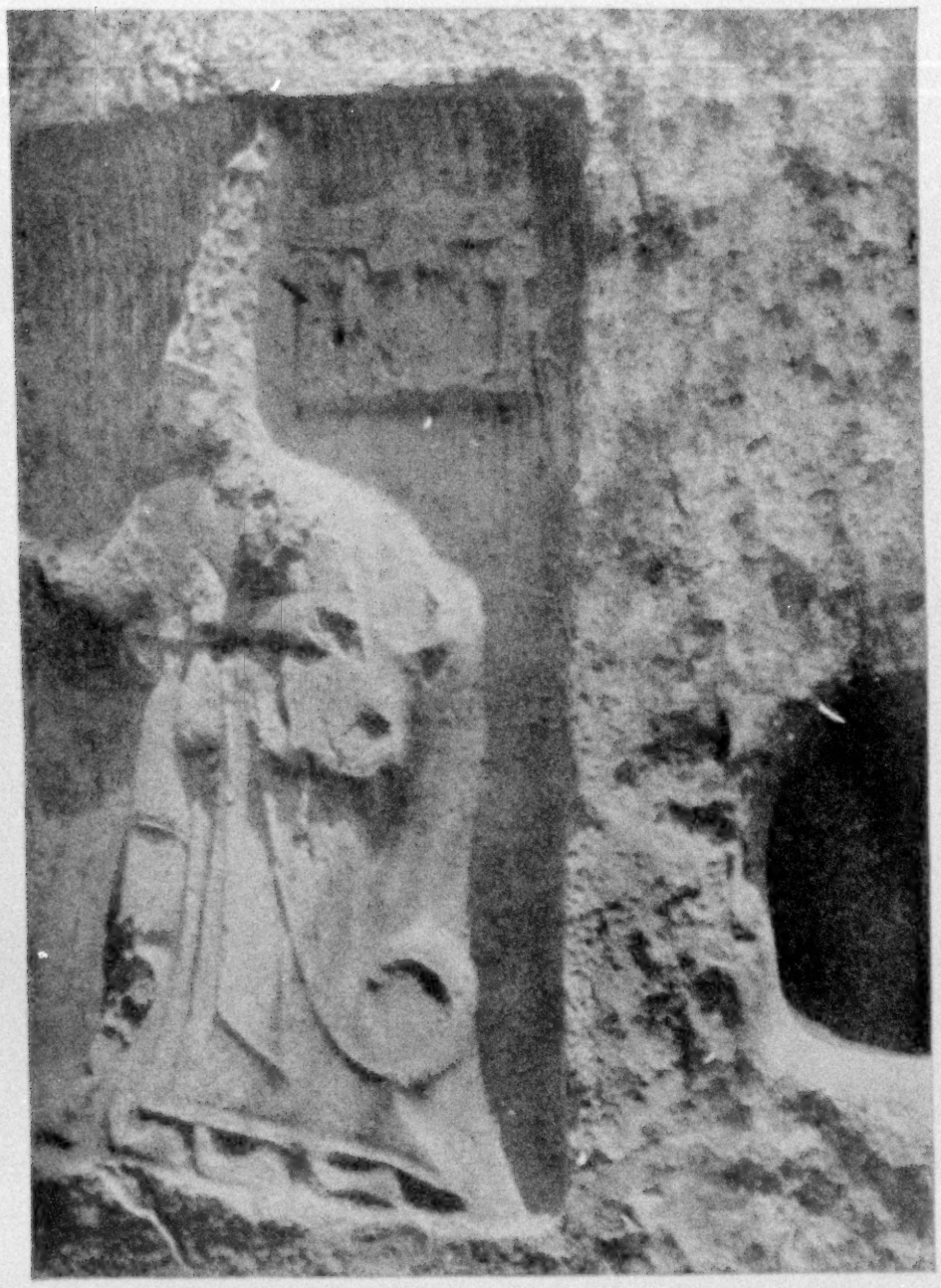
The real temple of the Hittites of Boghaz Keouy is considered to be found in the so-called "pictured rocks," a mile and a quarter to the east of the city. Over 500 feet above the valley we find one group of rocks, with no difference in its outward appearance from many another, but distinguished by two galleries, both faces of which show a remarkable series of pictures. The galleries now have no connection, though it is supposed that there was originally a way from one to the other, now filled with fallen stones.

The smaller of the two galleries has on one side 12 figures with Phrygian caps and turned-up shoes, carrying reaping hooks over their shoulders.

Opposite them is a strange figure, whose head is human and who wears the usual pointed cap and big, round earrings, but whose body is formed of lions—the shoulders of two half lions, jaws outward, while below these two other lions, head downward, seem to form legs. We know that Cybele, the earth goddess of Asia, was represented with lions as constantly as St. Jerome was in the early renaissance paintings, and it would seem as if these pictures were connected with her worship, the reapers but adding to the probability.

Also, just beyond this weird, lion-bodied goddess is a group of much better workmanship that may be a priest and king, or another god and the king. The god, if it is he, with Hittite cap and shoes and sword, is about six feet high, and is holding his arm about the neck of the smaller figure, who carries the curved lituus, so often seen in Hittite pictures, and who wears a flat cap and long robe.

In the large gallery there are many



THE HITTITE GOD AND KING (OR PRIEST) IN THE SMALL GALLERY AT BOGHAZ KEOUY

more figures, about 67, though some have grown indistinct of late years.

This gallery is more than 90 feet long—a great hall open to the sky, where the Hittites have united art and skill with the use of all the natural advantages of the spot. The floor in some places is simply leveled rock, in others a pavement so cunningly fitted to this that it seems all natural rock floor. The figures, who march from the open side of the hall toward the opposite closed end, are mostly in panels, and are smaller at the entrance, gradually increasing in size to the middle of the north wall, where the two processions meet face to face. I think this increase in size relates to the importance of the characters figured rather than to any Hittite idea of perspective.

There is much difference between the figures in regard to the workmanship, whether because of different periods in art, or simply because made by more or less skillful artists, we cannot tell. Some of the figures are partly or quite covered with a very fine brown enamel or thin, hard stucco, and these are, of course, the best preserved. Some are broken—parts gouged out, probably by the vandal boys of the neighborhood, through mere love of destruction.

There are rows of figures—12 in one place, 13 in another—something like the reapers in the small gallery. Then there are symbols and heraldic signs, and, toward the head of the procession, the figures stand on two mountains, or on the double-headed eagle, or on the necks of captives—these things indicating that here are gods or kings. Sometimes we see the crenelated crown, which, on ancient coins, indicates that the one who wears it represents the city. Some of the figures are dressed in accordion-pleated skirts and plain waists; one has an overskirt and a trail under it. A few wear the little flat cap, more the high, pointed Phrygian one. Some have sleeves almost as long as if they lived in the fourteenth century A. D. Some carry flowers, while almost all wear jewelry, either bracelets or ear-rings; but, unlike the Assyrian figures, there is little embroidery on their robes. Many of them (as has the Amazon at the Eastern gate) have a horn either on the cap or somewhere about them. They do not have the very large nose and inane expression of the Hittite sculptures of Cilicia. Indeed, the features are rather intelligent and refined.

The meaning of these carvings and of this great rock hall which holds them is still a problem. Was this a sanctuary of the earth goddess, and do these processions show the king of the land coming with his priests and his family and people to devote all that he has to the goddess? Or do they commemorate some special event, or represent some rites of nature worship? What are the meanings of the various symbols which accompany the single figures? It may be that the reading of the tablets that are found in Boghaz Keouy will answer all these questions.

Here in Turkey nowadays we are not only searching out much old history, but we are rapidly making new history. The bey of this district (the descendant of a Seljukian Sultan) exercises a truly Eastern hospitality, entertaining freely all visitors to Boghaz Keouy, rich or poor. We had camped on the hillside above the Hittite palace, and the bey came up the first night we were there to protest against such an infringement of his hospitable rule. This Turkish gentleman is deeply interested in the history connected with his land, and took pains to point out to us various places which, in his opinion and that of the archeologists, would be likely to yield important results if excavated. He has three fine boys, the youngest but an infant. The other two have been sent to school in the neighboring town, and he plans to have the oldest go to an agricultural college and the second to become a physician, that they may both work for the health and prosperity of his people.

Perhaps some day a new city will crown these splendid heights, and a happy and progressive people, under the good government of Young Turkey, will build up the life and associations which will make this beautiful spot once more famous.

THE INTERNATIONAL MILLIONTH MAP OF THE WORLD

By Bailey Willis, U. S. Geological Survey

FOR whatever the stature of his guest, however tall or short, that bed fits him to a hair. Because, if a man be too tall for it he lops his limbs till they be short enough, and if he be too short he stretches his limbs till they be long enough. Therefore is he called Procrustes the Stretcher."

Turn the leaves of any atlas and view the countries, large or small. How they are all fitted to the Procrustan page, some drawn to one scale and some to another, but all finally compressed to the same size in the atlas, although widely different in fact. Here is Colorado with 103,925, or Wisconsin with 56,040, or Massachusetts, Connecticut, and Rhode Island, all three together with but 14,555 square miles; but the last, like the first, precisely fills the page. If, in Massachusetts, there be two towns 12 miles apart, there is an inch between them on the map, but if in Colorado there are two 29 miles apart, they also appear upon the map within an inch of one another, the scale in the one case being 12 miles to the inch and in the other 29 miles to the inch.

This adjustment of the maps in an atlas to different scales to suit the size of the page appears necessary, because each page should be fully covered and the states or countries which need to be separately mapped are very unequal in size. In local thought the county is larger than the state and the state larger than the whole country, and atlases are made for local use.

But if we would take a broader view of the world and of nations, wishing to know something of the comparative size of countries—that France, for instance, is about four-fifths as large as Texas—it would be at least a great convenience to have an atlas of the world in which all lands were mapped to the same scale. Such an atlas the International Millionth Map of the World is to be.

The name signifies that the map is to be drawn on a scale of one to one million; that is, that any length measured upon the map is to be one-millionth part of the distance between the same two points measured on the ground. In the metric system this is equivalent to saying that a meter on the map is equal to a million meters or 100 kilometers on the ground. In our English measure it is equivalent to about sixteen miles to the inch. This is a fairly large scale, which allows the engraver to delineate villages as well as cities, railroads and the principal roads, all water-courses of note, and the general features of hills and mountains. Yet the scale is also such that a sheet of convenient size may represent a large area, on an average equivalent to a State of the United States, and thus the scope of the map is sufficiently generous to be useful.

Both in scale and scope we may contrast this one-millionth map with others which are made available to the public by the government surveys. The detailed topographic maps of the United States, which are prepared by the United States Geological Survey from original surveys, are published on a scale of one mile to an inch for the more densely settled regions of the country and of two miles to an inch for the less developed regions. This scale is so large that it is possible to show individual houses, every turn of the roads, and the precise form and altitude of all noticeable hills. With these maps, in advance of other surveys, an engineer may plan the route of a road or even a railroad through a hilly or mountainous country. Thus they are adapted to all detailed studies of local features, but their scale is so large that their scope is very

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small. By train or automobile we may traverse the area represented on a single atlas sheet in an hour or two, and one cannot conveniently carry enough sheets to trace the course of an extended journey.

In reducing the scale to 16 miles to the inch we reduce also the details which may be shown, and we must necessarily eliminate the local objects. But that scale is still sufficiently large to comprise all of the essential features which one would wish included in a general view, and the scope becomes such that a single sheet serves for a day's journey.

Maps of various parts of the United States, which approach the one-millionth in scale and scope, are not uncommon. Land Office maps, prepared by the general government, and state maps designed for different purposes have not infrequently been published with 10, 12, or 15 miles to the inch, and for some years past the Geological Survey has had maps in preparation with the design of publishing them on the one-millionth scale. But it has awaited the conclusion of an international agreement before pushing them to publication.

THE ORIGINATOR OF THE PLAN

It was in 1891 that the proposal for a standard international map of the world was first made by Prof. Albrecht Penck, then professor of geography at the University of Vienna and now at the University of Berlin. Professor Penck, who was at that time a young and comparatively little known man, might have found it difficult to arouse interest for his plan except that he was able to bring it before the International Geographical Congress which met in Bern in that year. The geographers who were there assembled knew from their own experience the great inconveniences which arise from the use of maps on many scales, and they appreciated the great advantage which would accrue to the study of geography if we could but have one standard map on a uniform scale. They therefore took up the project, passed resolutions favoring it, and committed the plan to a committee with instructions to report at the succeeding congress.

The members of the committee represented ten different countries and were twenty in number. The list of names includes the leading geographers of the time and men high in official rank, whose duties in other directions were already onerous. Mr Mendenhall, superintendent of the Coast and Geodetic Survey, and Major Powell, director of the Geological Survey, represented the United States. It might have been foreseen that so large a committee would be ineffective, because it was impossible to assemble the members for discussion. Recognizing the need of an efficient subcommittee to study the problem and formulate proposals, the general committee invited three representative scientists of Switzerland, at the head of whom was Eduard Brückner, then professor of geography at the University of Bern, to act in an advisory capacity, and to this subcommittee is due the credit of such progress as was made in the development of the question. A report submitted by Professor Brückner at the Sixth International Geographical Congress at London, in 1895,* contains a discussion of all the principal items on which agreement was necessary, and presents clearly the difficulties which arise from different usages in cartography.

But if the general committee failed as an executive body, it served most excellently to make the plan widely known, as is shown by the list attached to Professor Brückner's report of twenty-one articles published in the interval between the two meetings of 1901 and 1905.

At the Geographical Congress held in Berlin in 1899, Professor Penck again brought forward his plan for a world map, but the difficulties of adjusting national differences seemed insuperable. Prominent among these were the absolute refusal of the English geographers

* Brückner, E. Rapport du Président de la Commission pour l'Établissement d'une Carte de la Terre a l'Echelle de 1 : 1,000,000. Report of Sixth International Geographical Congress, London, 1895.

to accept the metric system and the insistence of the French geographers upon the meridian of Paris as the initial meridian of the international map.

IMPORTANT PROGRESS AT THE WASHINGTON MEETING

At the Eighth Congress, held in Washington in 1904, Professor Penck took advantage of the fact that France, Germany, and Great Britain had separately prepared maps, on a scale of one to one million, of countries as far apart as China, India, Persia, Africa, and the Antilles, to congratulate the assembly upon the progress made toward the world map. Setting aside as relatively inconsiderable the differences in arrangement and execution of the several maps, he dwelt upon their uniformity of scale and took a hopeful view of the outlook for future agreement. He said:

"It is thus for the first time that different parts of the earth's surface are represented so that they can be directly compared with one another. One who is familiar with Cuba needs only to lay the French map of this island at the side of the German or French map of China to see at one glance that space which has been overwhelmed in the Russo-Japanese war. A student of the coast line can now compare the bays of Shantung with those of Cuba, and another can compare the behavior of the rivers in south Abyssinia with those in south China, and a third will be able, by the chosen projection, to determine the exact areas of lands, rivers, basins, lakes, and so on. All this indicates considerable progress in the practical and theoretical study of different parts of the world—a progress which is not essentially affected by the fact that the maps are not so uniform as was desirable."

After discussing the differences existing among the maps undertaken by the European powers, Professor Penck pointed out that there was no general map of North or South America, or even of the United States, such as any student or traveler requires, and he urged that the Geographical Congress should endeavor to induce the United States to do for America what Great Britain is doing for Africa; that is, to prepare a uniform map of both the American continents on a scale of one to one million.*

The action of the Eighth Congress led to no official result, but the arguments presented by Professor Penck for a general map of the United States bore fruit in the work of the Geological Survey. By authority of the director, Mr Walcott, Mr Henry Gannett prepared a number of maps designed to become part of the one-millionth map of the United States. They were, however, not adjusted to any general plan of the map of the world, as no international scheme had then been agreed to. The units chosen were states, and the drawings were made in accordance with the methods of cartography which have become familiar through the atlas sheets of the Geological Survey. The representation of altitudes by brown contour lines was worked out in great detail for the scale, and peculiarly distinguished the maps in contrast to the effects of shading employed by the French and German cartographers.

Mr Gannett's interest in the project for a world map became an important factor in its further development. At the Ninth International Geographical Congress, held at Geneva in July, 1908, he presented through the American delegate, Dr David T. Day, resolutions urging that the Congress take effective measures toward an agreement upon the essential details of the plan, and that these measures be commended to the several map-making powers with a request for an international conference having authority to act upon them. The resolutions were passed, a committee was appointed, and the details of a plan were worked out and adopted. The British representative, Col. C. F. Close, on request of the Con-

* Penck, Albrecht. Plan of a Map of the World. Report of the Eighth International Geographical Congress, pp. 553-557. Washington, 1904.

In the same report is a notice by General Berthaut, of France, and one by Major Hills, of England, on the one to one-millionth maps in preparation by their respective governments.

gress, accepted the responsibility of presenting to his government a suggestion for a conference at London. And thus the plan which a few years before had seemed hopeless of accomplishment was brought within promise of fruition.

THE CONFERENCE AT LONDON

In the summer of 1909 the British government issued invitations to Austria-Hungary, France, Germany, Italy, Japan, Russia, Spain, and the United States to send delegates to a conference to assemble in London on November 16, with power to agree upon details of the standard international map of the world. All of the governments accepted except Japan, and twenty-two delegates assembled in the British Foreign Office, in the council-room where Lord Salisbury had been wont to hold the meetings of his cabinet.

The sitting of the conference was dignified and impressive. The great square chamber was furnished with a round table, at which all the delegates were seated within convenient range for discussion. There was a touch of old England in the soft-coal fire, which dispelled the chill of London in November, and the bunch of quill pens spread before each member was a reminder of the historic documents that had been executed in Britain's capital.

Under the presidency of Col. S. C. N. Grant, of the British Ordnance Office, assisted by Col. C. F. Close, of the General Staff, the deliberations of the conference were conducted not only with courtesy, but with impartiality and fairness. These officers had but one purpose in view: to ascertain the wishes of a majority of the delegates and secure such an expression of opinion as would lead to a unanimous conclusion. And in this they were signally successful.

In the circle sat men who had been associated with the project since its beginning, and who rightly felt a deep sense of satisfaction in its fruition. Professor Penck, the originator of the plan and now the representative of the Emperor William, was the leading figure, but he took his part with that scientific spirit which effaces the personal element, and a bystander unfamiliar with the past history of the plan would not have known from anything which he said that it had sprung from him. Across the table from him sat Eduard Brückner, who, holding the professorship at Vienna which had been vacated by Penck's transfer to Berlin, was the leading delegate from Austria. France was represented by several eminent geographers, of whom Charles Lallemand, a distinguished geodesist, shared with Professor Penck a commanding position among the foreign delegates. Around the table were many others whose names are well known as teachers and writers on geographical subjects. The delegates from the United States were Mr S. J. Kübel, chief engraver of the U. S. Geological Survey, and Mr Bailey Willis, geologist, of the same service.

FRANCE ACCEPTS THE GREENWICH MERIDIAN AND ENGLAND RECIPROCATES BY ACCEPTING THE METER

The conference took up one by one the proposals of the General Congress and debated them in English, French, or German, as the convenience of any individual speaker prompted. There had evidently been much preliminary discussion at home, and there was a dominant purpose to arrive at a satisfactory conclusion which swept away all the international differences that had previously prevented agreement. The initial meridian of Greenwich was adopted unanimously, without debate. The metric system was agreed to by the English and American delegates, with the provision that the scale of distances might also be stated in terms of miles or of any other unit (such as Russian versts) of the country producing a part of the map. The acceptance of the metric scale extended also to the statement of altitudes above sea, with the proviso that the height in feet may be given in parentheses after the number in meters. The conventional symbols to be used for representing water-courses, roads, railroads, towns, cities, and the

names of various features were agreed to in detail after thorough discussion by a large subcommittee. The result embodies practically all the conventions used by the United States Geological Survey, in the form in which they are employed in the government maps.

"FLORENCE," "ROME," "VIENNA" WILL DISAPPEAR FROM THE MAP

In writing and spelling names the Latin alphabet alone may be used and the spelling shall be that of the official maps of the country represented. Thus the international map will show nothing of Russian or Chinese script. You will look in vain for Florence, but will find Firenze; instead of Rome, Roma; of Flushing, Vlissingen; of Vienna, Wien, and so forth. There was no dissent from this last ruling except in one instance. In odd contradiction to the general liberality of feeling, it was emphatically declared that European geographers could not permit Stamboul, the Turkish name, to replace Constantinople. For China the adopted spelling was to be that of the post and customs service, and in all colonies or protectorates the names are to be spelled in accordance with the usage of the governing country. The delegate from Hungary presented the grave difficulty which confronts the cartographer in the fact that nearly all Hungarian towns have two names, one Hungarian and the other German, and some of them have as many as five names, all of which are currently used by the distinct elements of the population. But it was pointed out that this difficulty affects but one or two sheets of the great atlas of the world, and that the question of choosing among these names might well be left to the Hungarian government.

HOW ELEVATIONS WILL BE INDICATED

There is perhaps nothing which more strikingly distinguishes new maps from old ones, or maps of one nationality from those of another, than the manner in which valleys, hills, and mountains are represented, whether it be by drawing the shapes of mountains, as in Chinese maps, or by covering the paper with short dashes, sometimes called hachures, which show the way the water runs, or by horizontal lines that delineate the contours of the slopes, or by shading with high light and shadow, as if the map were a relief model. Hachures, contours, and relief shading, or combinations of two or even of all three methods, characterize modern topographic maps, and one of the most difficult questions before the conference was to harmonize the various methods in current use.

In maps prepared by the United States Geological Survey contour lines alone are used, and the delineation of mountain forms by means of them has been brought to a higher degree of graphic expression than ever before. This is due to the fact that the American topographer regards his work as a profession rather than as a side issue of military training, which is the position which holds abroad.

In Germany and Austria the method of exhibiting slopes by means of hachures has replaced all other systems, because it is so applied that the proportion of dark lines to intervening light spaces bears a mathematical relation to the steepness of the slope. Level plains are white, and slopes of 45 degrees are almost black, and other slopes are shaded according to their grade. These maps are peculiarly adapted to military purposes, since an officer can judge at a glance the nature of a declivity and whether it is passable by infantry, cavalry, or perhaps artillery; but these advantages do not everywhere have weight, and the method is one which is too expensive in execution and too limited in usefulness to be widely adopted. France has brought relief shading to a very high degree of perfection, and leads the world in the artistic beauty of her topographic maps.

The method of representing the topographic relief of the surface which the conference adopted consists in the main of generalized contours, which shall be so drawn as not to unduly obscure other features of the map, and, in addition,

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shading is to be used to bring out those minor features which cannot be adequately represented by contours.

The map up to this point will comprise the representation of streams and all water bodies, of towns, railroads, and highways, of political boundaries, of the topographic relief, and the names pertaining to all these features. It will be what may be called a base map, adequate in itself for all ordinary uses of the student and traveler, but capable of receiving additional data which convert it to a special purpose. In connection with our census, it might be used to express density of population by overprinting different shades of color. Similarly, it might be used as a crop map, a weather map, or a geological map, or to bring out the relations between lines of transportation or works of internal improvement, whether national, state, or private. Thus this base map contains in itself and in its adaptability to a large number of special purposes the highest practicable possibilities for usefulness.

The conference in London, having had its origin among geographers, felt constrained to emphasize the geographic side of cartography, and particularly the representation of altitudes of continents and mountains with reference to sea-level. These relations are indeed adequately expressed by contours, if one examines the map with sufficient care, but it is desirable, especially upon a general map of large scope and moderate scale, to bring the distribution of altitudes more strinkingly into view. To that end the conference adopted a scale of colors, which should be printed on different portions of the map, according to the height above sea. The depths of seas and lakes shall be shown by shades of blue; the lower lands, from the coast to 300 meters (984 feet), by three tints of green, shading into pale buff, which at 500 meters passes into light browns, that grow darker up to 3,000 meters. Above 3,000 meters the brown tints tone into rosy violet, and fade away to white in the highest summits beyond 7,000 meters.

As applied to the United States, the effect of this color scheme will be to exhibit light tints of green and buff over the Atlantic slope and throughout the Mississippi Valley, and from their expanse the Appalachian Mountains will stand out in tones of brown. Similar brown tints will indicate the rising plains between the Mississippi Valley and Colorado, while the summits of the Rockies and of the Cordillera will carry the violet notes of high altitude. On the Pacific slope the bands of color will be closely crowded, bringing out at once the gradations in tint and the relatively rapid rise from the sea to the mountain crests.

THE ATLAS WILL CONTAIN ABOUT 1,500 SHEETS

The arrangement of sheets of the one-millionth map is shown for the northern hemisphere on page 131. It will be noticed that each sheet measures 4 degrees of latitude by 6 degrees of longitude. Thus 60 sheets belt the earth and 22½ sheets extend from the equator to the pole. In the discussions of the conference the execution of the circular sheet covering the northern polar regions within the parallel of 88 degrees was courteously committed to the United States. To represent an entire hemisphere would thus require 1,321 sheets, and for the entire world twice that number; but since three-fourths of the earth's surface is ocean, the atlas will probably never comprise more than 1,500 sheets, including the oceanic islands. These sheets are so designed that they may be fitted together, without appreciable gaps, to any number that may reasonably be placed upon a single wall, and since they will be executed through international cooperation, without reference to national boundaries, according to a uniform style and method, they will really constitute a single great map of the world.

THE MAP SHEETS OF THE UNITED STATES

The sheets which fall upon the area of the United States, including parts of the adjacent oceans and of Canada and Mexico, but excluding Alaska, are 52 in

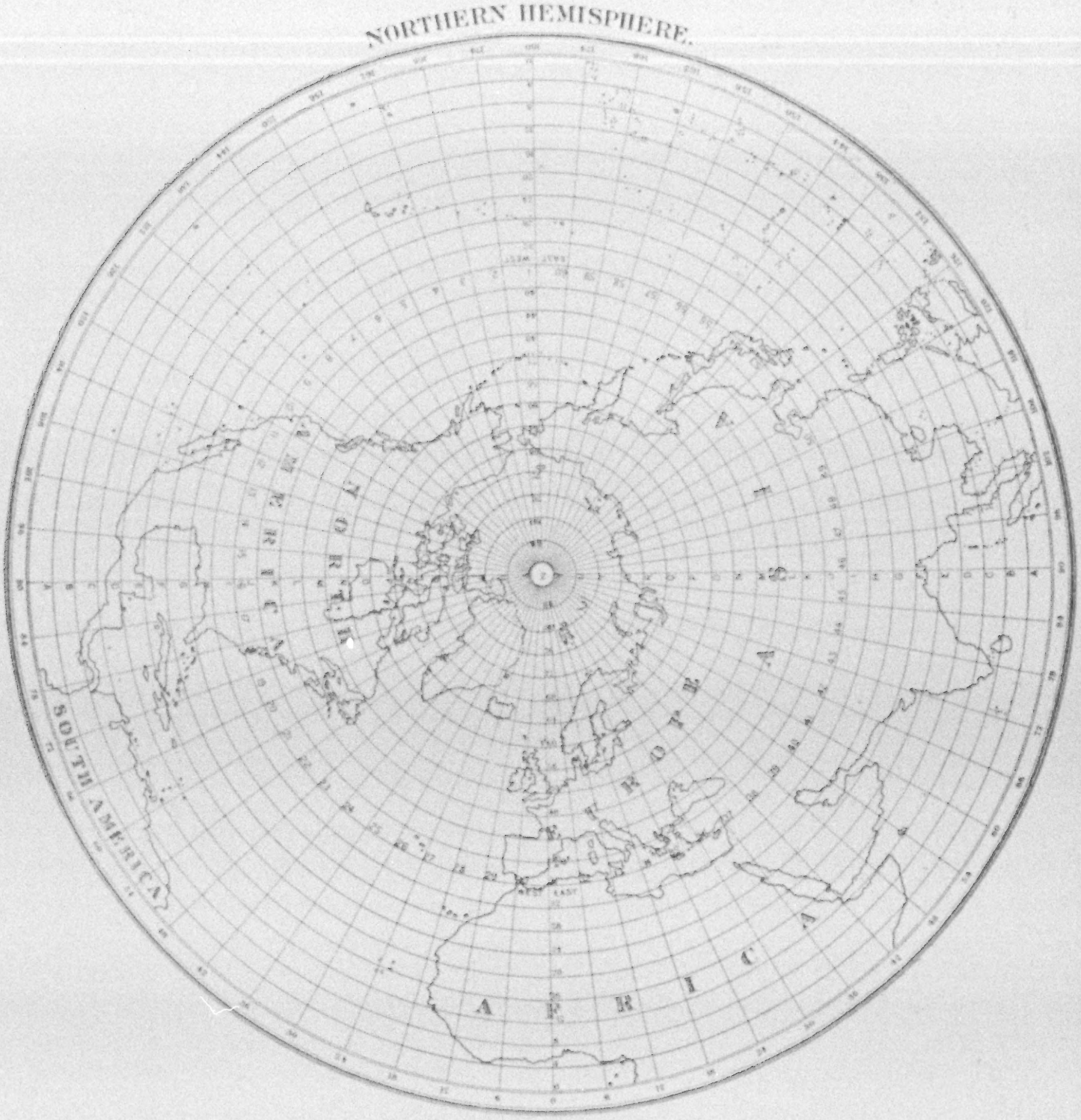


DIAGRAM SHOWING ARRANGEMENT OF SHEETS FOR THE INTERNATIONAL MAP ON THE SCALE OF 1 : 1,000,000

number. The United States Geological Survey now has in course of preparation nine of these sheets, covering parts of the Eastern, Central, and Western States. The originals are being drawn on a scale of one-five-hundred-thousandth, or 8 miles to the inch, and in such a manner that they may be reproduced by photolithography in a clear and effective manner for publication on a scale of 10 miles to the inch. In this form the maps may become immediately available for use by the departments of the government or by individual states; and eventually, as Congress provides the means, they will be engraved and published on the scale of one million (16 miles to the inch), with all the details

required by the decisions of the international conference at London. It may be assumed that they will then be available to any one at the cost of paper and printing, as is now the case with the topographic atlas sheets prepared under the same auspices.

ALL GOVERNMENTS UNITE TO COMPLETE THE MAP

The unanimous conclusions of the London conference have pledged the great powers to the standard map of the world, which Professor Penck proposed eighteen years ago. The need of that map is greatest concerning the countries which have been least adequately mapped, and among these we must count both Americas, as well as Africa, Asia, and Australia. Good maps exist of all of Europe, ranging in scale all the way from one to twenty thousand up to one to one and a half millions.

For Europe the data are all available, and the preparation of the one-millionth map is a question of a contract between some one of the great publishing houses of England, France, or Germany and the governments that are interested. It was understood at the conference that the work would thus be committed to one establishment, so far as Europe was concerned, in order that uniformity might be secured.

But the United States government is gathering the original data for the mother maps of this country, and is compiling and publishing them at a cost much below that which a European publisher would necessarily charge. It therefore, through its delegates at London, declined to send the original data to Europe, and reserved to itself the preparation of these original maps. It is to be hoped that the task may be prosecuted with energy, and that the first edition of the one-millionth map of the United States as a part of the standard map of the world may be engraved and published within ten years.

This compilation will then represent the state of knowledge at the time of completion of each sheet. As surveys progress, corrections and additions will be necessary, and the progress of improvement in the map will become an index to the progress of civilization in our country.

THE LAND OF THE CROSSBOW

By George Forrest

THE journey here described was made with the object of exploring botanically and geographically that portion of the Salwin Valley lying between 26° and 27° 30′ north (for map see page 147).

The tract of country between the parallels mentioned was "terra incognita," and had been persistently shunned by all, Chinese and Europeans alike, as inhospitable, barren, and unnegotiable; certainly, as will be found hereafter, we found it so, but despite these disadvantages it had one point of absorbing interest. Here in this region, comprising the whole of the basin of the Salwin, was supposed to be the home of the Lissoo race; from that point the offshoots spread northeast, east, and south over practically the whole of the province of Yunnan and parts of northwestern Szechuan.

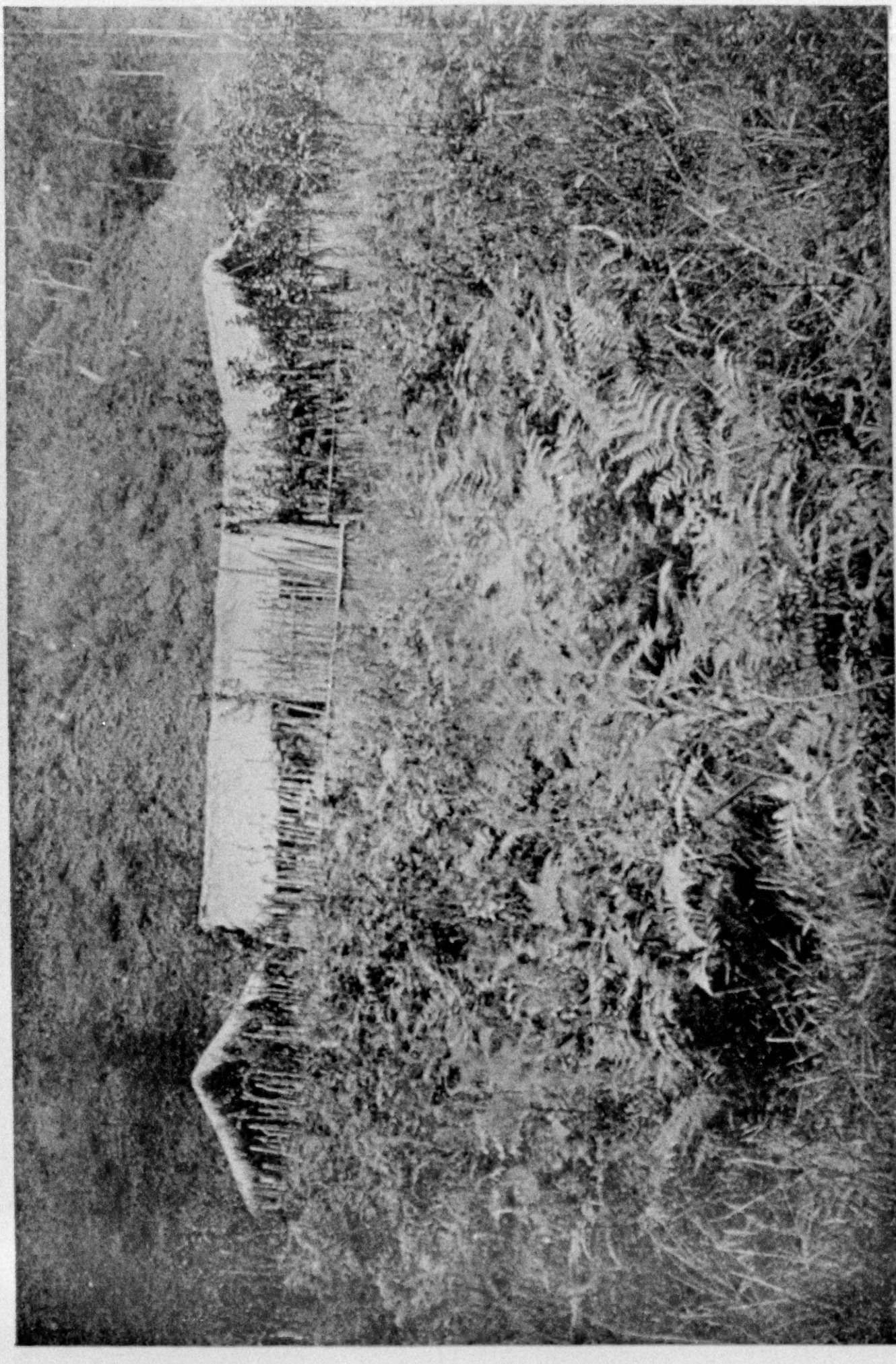
Starting from Teng-yueh-ting in perfect weather, we traveled due north, and on the fourth day passed the last Chinese village and entered the country of the Lissoo, camping near the hamlet of Ta-chu-pa. This, in keeping with most of the Lissoo villages, was only a miserable collection of a half dozen rain-sodden huts, thatched with coarse grass, and with eaves so low that to enter one

THREE LISSOO GIRLS OF TA-CHU-PA

had to bend almost double. It was, however, unique in being surrounded by a stockade of alder logs, most of which had taken root, forming a dense hedge. Probably the reason of this unusual possession was the position it held, being situated at the base of one of the passes leading over the divide into Burmese territory, and therefore liable to raids by the natives of that region.

The head-man of Ta-chu-pa soon found us a sufficient number of men to act as porters, and a day was spent apportioning loads to be carried on the back, consisting of a reserve supply of rice, done up in rawhide bags—a most important item in the baggage, as we could not count on buying food of any description or in any quantity in the country to the north of us. A Lissoo can carry on his back for full stages of 6 to 8 hours, in difficult and mountainous country, about 70 pounds weight, but he daily consumes 1 pound 7 ounces of dry rice.

All preparations for a move forward having been made, our bad luck began. The southwest monsoon returned, and for twelve days an almost continuous



THE LISSOO VILLAGE OF TA-CHU-PA: ALTITUDE, 7,000 FEET

deluge ensued. Camped as we were in the open, surrounded on every side by dense bracken and grass, averaging 4 to 5 feet in height, we were soon in the depths of misery. Even with improvised shelters over them it was with the greatest difficulty we could keep our fires alight. We did resort to the huts, but, with the number of our men added to the inhabitants, the accommodation was so taxed, the smoke of the fires—for which in the heavy state of the atmosphere there was little or no escape—so acrid, and the stench of steaming, vile humans so offensive, that eventually we were glad to return to the cold, damp comfort of our tents.

The weather having become more settled, we crossed the Irrawadi-Salwin divide by the lonely but beautiful Pienma Pass, 10,500 feet, and descended the Ku-tan River, a small tributary of the Salwin. From the village of Ku-tan we turned north, and on October 30 (1905) reached the village of Lu-chang, the residence of a semi-Lissoo chief, where Mr Litton had camped during his previous journey. The village is in a fine and healthy situation, some 3,000 feet above the river, and the people most friendly. The chief, who is a boy of 10 years of age, came to call on us, and a number of men offered their services as porters.

A DIFFICULT TRAIL

From Lu-chang we sent back the baggage animals and proceeded on foot for three marches northward—32 miles by the track, but scarcely 14 in direct line—and here the difficult nature of the country was first thrust upon us.

To travel continuously at the level of the Salwin, or even 1,000 feet above it, means fever in a very short time for native or European, and that even during the dry season; to be completely out of the danger zone one has to be from 2,000 to 3,000 feet above the river. The surface of both flanks of the valley is corrugated with huge spurs, intersected by deep and precipitous ravines, and the tracks, such as they are, lead up and down over a series of these ridges, which descend right from the tops of the divides to the Salwin.

To negotiate them is a trial of strength to the traveler's legs. Thus, starting from Lu-chang, at 6,400 feet, there is a steep drop of 3,300 feet to the Salwin in 4 miles; then follows an ascent of 4,000 feet through grass and pine forests to the top of the next ridge, 800 feet above the scattered village of Mao-chao—14 miles from Lu-chang—which, like Lu-chang, among its log and bamboo huts boasts one tiled house, the so-called yamen, the residence of the hereditary native chief. From Mao-chao there is a rough track which, after some steep ups and downs, plunges 1,500 feet into a tropical jungle of palms and lianes, through which runs one of the numerous mountain torrents which are the only tributaries of the upper Salwin. Then a precipitous climb of 900 feet through cultivated patches leads to the ridge of Shih-pai-li-ti, 6,700 feet and 10 miles from Mao-chao. Between Shih-pai-li-ti and Pei-pa (8 miles) there is an even steeper gully, the bottom of which is 2,000 feet below the level of the ridges.

The above gives only a faint conception of the difficulties negotiated. Later on, where there was practically no communication between the villages, we had to make our own tracks, and it was no uncommon thing for us on rising in the morning to have distinctly in view, only a mile or two distant, the site of the following night's camp, invariably reached only after a long day's exhaustive toil.

In all this country the villages are scattered along the opener sections of the ridge tops or on natural terraces in the mountains at from 5,000 to 7,000 feet. Above 7,000 feet to the top of the divide the country is too steep and rocky and the forest too dense to admit of villages or cultivation; below 5,000 feet the country is too malarious, but every village has its patch of rice-fields 2,000 to 3,000 feet below it by the banks of the Salwin, whither the inhabitants descend to sow and reap much as they did in the time

of Marco Polo. This obtains as far north as the village of Hsia-ku-dè; beyond that nothing but maize, which is the staple food of the people, is grown.

PROFUSE ORNAMENTS WORN BY THE WOMEN

The people are all Lissoo, with a strong admixture of Chinese blood. The men mostly dress in Chinese fashion, but the women, while adopting the Chinese cotton cloth, retain the petticoat and profuse decoration of head, with armlets, bracelets, and necklets, which is so characteristic of the true Lissoo garb. I have seen young girls with ornaments which in the aggregate must have weighed 15 to 20 pounds. It made one positively weary to look at some of them. The necklaces generally consist of discs of polished bone 1 to 1½ inches in diameter, cowry shells, which are said to be imported from Tibet—at any rate, they filter down stream from the north—variously shaped pieces of silver and water-worn pieces of a poor quality of turquoise which is found in the valley. In addition to these there are generally several strings of large blue beads, which, I understand, are brought over as barter from the Mekong Valley by a few Minchia traders who are daring enough to risk their all dealing with those people. The bangles and armlets are mostly of pure silver, very rarely copper is seen, and in this manner most of the girls carry their dowry about with them.

Few of the people can speak any Chinese except the chiefs and their families. They hardly go beyond their own villages and seem to live happy, quiet lives, only disturbed by the occasional difficulty of obtaining food and by the trouble and petty exactions which attend the work of collecting the chiefs' tribute, or house-tax, of half a tael (=1 shilling 4 pence) per annum. The usually peaceable condition of this portion of the valley is no doubt due partly to the general absence of interference by the Chinese mandarins, which is owing to the fact that the country is too poor to be worth squeezing. The chiefs have none of the machinery and exercise none of the functions of a regular government, except collecting their dues, in which they are assisted by a Chinese clerk. Each village seems to regulate its own affairs through its headman.

A PECULIAR RIVER

In this section of its course the Salwin at low water varies from 90 to 130 yards in breadth and in most parts is of great depth. There are no falls, but numerous rapids, at some of which the river is contracted to less than 80 yards. The volume of water in the rains is enormous; we found unmistakable signs of the river having risen, in August, over 40 feet above its November level. In the fine season the water is intensely cold. The river is here confined, not indeed between precipices, as was supposed, but between a series of steep ridges, falling down in endless succession from the Mekong and Irrawadi divides. In many places these ridges have a final sheer drop to the river of 500 to 1,000 feet, so steep indeed that, even if climatic conditions allowed of traveling at water level, it would be found impossible to circumvent their bases.

The upper Salwin is quite free from the great bends which characterize the Yangtze; it also receives no tributary beyond a few mountain torrents, the reason of this being, of course, the extreme narrowness of the Salwin basin. At latitude 26° 30′ north an airline of 18 miles would join the east and west limits of the basin, while in latitude 26° 50′ north a line of 40 miles would span it and also the basin of the Mekong.

North of Luchang, on the west or Irrawadi side of the Salwin, the mountains are exceedingly precipitous, and come down in a series of fantastic, jagged ridges, divided by deep gutters. Altogether our advance up the river was slow in the extreme; even the river banks at the few places where we risked following them were encumbered by enormous boulders, piled together like Pelion upon Ossa, rendering progress most difficult.

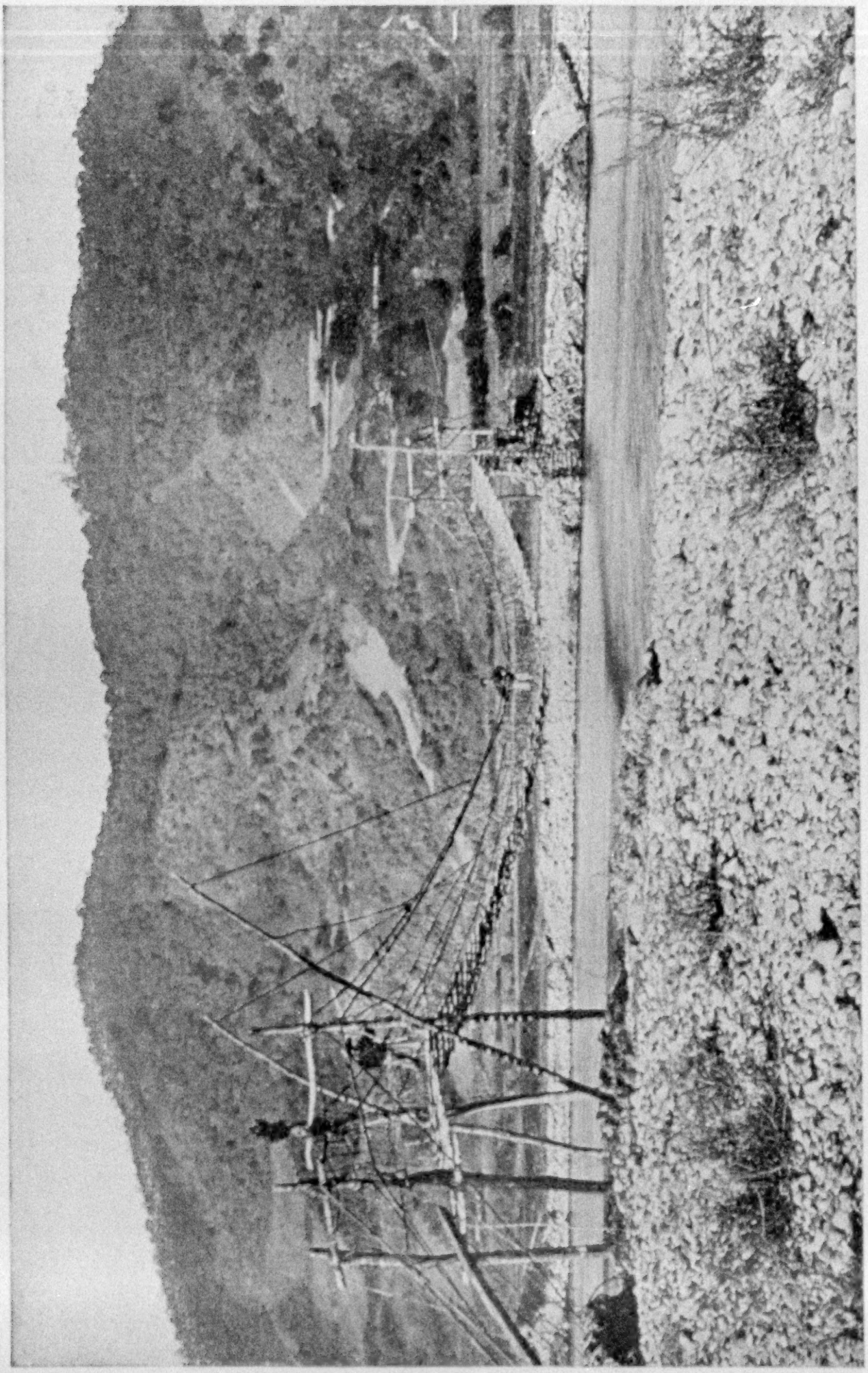
GROUP OF LISSOO NATIVES: TA-CHU-PA

The basis of the rock formation of the Salwin is limestone and the strata of the higher slopes are tipped up so as to point to the sky.

FEW BIRDS BUT MANY TROUBLESOME INSECTS

Animal and bird life along the Upper Salwin is conspicuous by its absence—an important matter for the traveler, who cannot count on replenishing his larder with game. On the other hand, the river banks at a low altitude, and where wholly sheltered from the northwest winds, have an almost tropical climate, and as the result vegetable and insect life is both vigorous and troublesome. Creatures with inconveniently long legs plunge suddenly into one's soup, great caterpillars in splendid but poisonous uniforms of long and gaily-colored hairs arrive in one's blankets with the business-like air of a guest who means to stay. Ladybirds and other specimens of coleoptera drop off the jungle down one's neck, while other undesirables insert themselves under one's nether garments.

The light in the tents attracts a perfect army of creatures, which creep, fly, crawl, buzz, and sting. Scissor insects make the day hideous with their strident call, and the proximity of Lissoo coolies introduces other strangers, of which *Pulex irritans* is by far the least noxious. The mere act of walking in this country is a work of much physical exertion. The villages under the Chinese chiefs have a laudable custom of cutting out their roads every year after securing their harvest, but in the country north of Cheng-ka constant feuds between neighboring villages prevent this useful work; the paths are narrow tracks choked with the luxuriant growth of the previous rains, slippery and lop-sided, and as often as not leading along the very brink of a precipice. In some places we had to haul ourselves over boulders by pendant branches or scramble along the face of cliffs by notches in the rock, work suitable for



SUSPENSION BRIDGE WITH SPAN OF ABOUT 125 FEET, CONSTRUCTED OF LIANA CANE AND SAPLINGS; NEAR TA-CHU-PA

monkeys, Lissoo, or other creatures gifted with more prehensile feet than a European.

MAGNIFICENT SCENERY

Poisonous-looking scarlet fruits hang from the overarching jungle, lianes and tree-roots trip up the unwary traveler; if he clutches the nearest plant to save himself the chances are it is a stinging nettle of the size of a laurel and poisonous in proportion. In some places especially around their maize fields, the natives provide a further diversion in the shape of "pan-ji." These are sharp-pointed, fire-hardened pieces of bamboo, which are driven into the ground among the grass, and will, if trodden upon, pierce even through a leather boot and deep into the foot. It is only when the traveler, scratched, bruised, and with torn clothing, emerges on a quiet sand bank by the river, or on to some open terrace high above it, and finds the campfire lighted, the tents pitched, and a pailful of hot water ready for a bath, that he begins to think exploring the Salwin a game worth the candle.

The vegetation in that part of the country is almost as great a nuisance as the insects. Every sort of seed attaches itself to one's person; some are provided with hooks, others with natural gum, others pierce the skin or work down under one's socks. An hour's march leaves the traveler caked with the seeds of enough plants to form the material of a work on the methods of the natural dispersal of flora.

But the scenery of the Upper Salwin can never be forgotten by any one who has wondered at it in the rich sunshine which prevails after the autumn rains have given way to the first touch of winter. The great variety of rock formation, the abundant forests and vegetation, and the diversity of light effects between the summits of the ranges at 10,000 to 13,000 feet and the abyss in which the river flows produce a vast panorama of ever-changing beauty. In the morning the sun, as it touches the top of the Mekong divide, sends wide shafts of turquoise light down the side gullies to the river, which seems to be transformed into silver. The pines along the tops of the ridges stand out as if limned by the hand of a Japanese artist. In the evening all the wide slopes of the Mekong side are flooded with red and orange lights which defy description or photography and would be the despair of even a Turner. The traveler whose fortune it has been to explore the great rivers of this our northeast Indian frontier will admit that the Salwin, while it is inhospitable, difficult, and barbarous, far excels in natural beauty all the valleys of the sister rivers, the Yangtze, the Mekong, and the Irrawadi.

OUR FIRST MEETING WITH THE CROSSBOW

Continuing our march from the sand bank below No-li-ka, 7 miles from Pei-pa, we toiled up a steep slope to the terrace and village of Shih-chi-di, 1,500 feet above the river; here we had a good reception from the Lissoo, deputations from several villages round offering us small presents of eggs and rice. From this point northward the people were clad in the Lissoo style, and few or none could speak Chinese.

On clearing the top of a ridge we found ourselves confronted by a number of warriors with huge crossbows, headed by the local "ni pa" (prophet or medicine man). He produced a paper scrawled over with rude imitations of Chinese characters, and declared he had received instructions from heaven to go and kill somebody, and that he thought the headman of Cheng-ka was the most suitable person, but he desired our advice. We strongly recommended him to go home and see to the grinding of his maize crop.

All along the road we met a number of warriors hastening to follow the prophet to Cheng-ka, but they were far from wishing to molest us; indeed, several of them left the warpath to escort us on our way, and, after seeing a twelve-shot repeating Winchester rifle fired, desired our alliance and assistance in the projected raid on Cheng-ka.

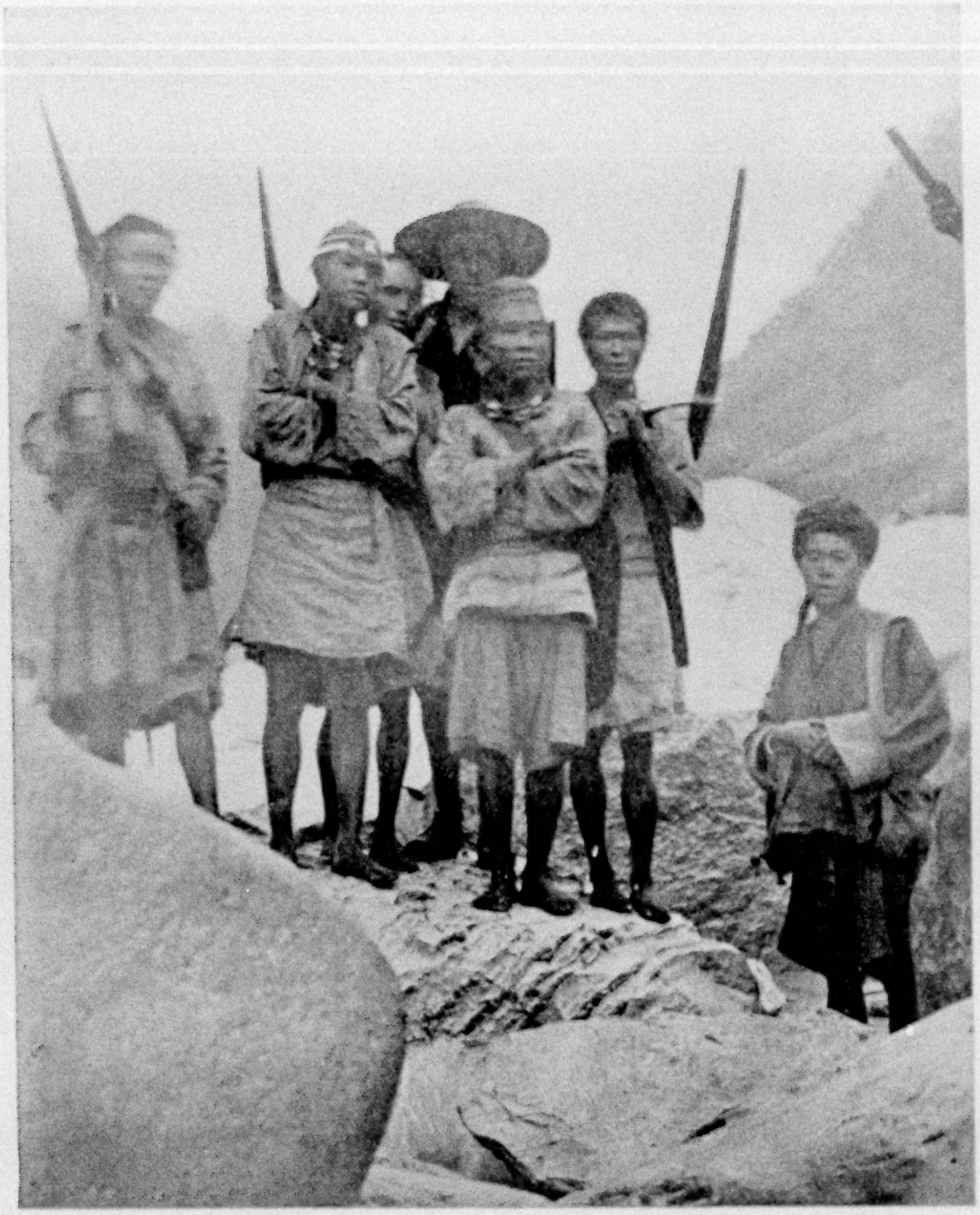
After leaving our bellicose friends we crossed another gully to Hsia-ku-dé, a

A LISSOO OF THE SALWIN VALLEY

large village for this country, consisting of some 40 houses of the true Lissoo type, constructed of rough logs and bamboo matting, raised on piles, with one room only and a tumble-down verandah. A stone hearth occupies the center of the room, and around this the family eat and sleep. The head-man was a typical old Lissoo, tall and thin, with a close-shaven gray head, bleary eyes, an aquiline nose, huge earrings of silver and cornelian, and a profusion of bracelets and beads hung about his person and over his dirty hempen clothes.

SINGLE-ROPE BRIDGES

It was near here that we first saw a single rope bridge across the Salwin. These single-rope bridges of the Upper Salwin are far more difficult to cross than the double ropes of the Mekong, by which the passenger always starts from a higher level than that at which he lands on the other side, and is thus rapidly car-



A GROUP OF LISSOO OF THE VILLAGE OF LO-MA-DI (SEE PAGE 145)

ried across by his own weight and with little or no exertion. On a single-rope bridge, however, after having been trussed by cords onto a runner, it is necessary to haul one's self across hand over hand; as one is tied with face to the sky and back to the water, this is a difficult operation. As the Salwin ropes are made of very roughly twisted cane, there is always the chance that the whole affair will break in the middle, and the certainty in any case that one will arrive on the opposite side with hands full of painful splinters off the rope.

After leaving Hsia-ku-dé we found that the country increased in wildness with every march, and the inhabitants in squalor, poverty, and barbarism. Every village which we passed gave us terrifying accounts of the ferocity and savagery of the next, where we should infallibly have our throats cut, etc. On the Lower Salwin we had heard stories of people on the upper river who never attempted to

LISSOO WARRIORS OF THE SALWIN VALLEY

The arrow shot by the crossbow is poisoned, and travels with such speed that it will pierce a deal board an inch thick at 70 yards (see page 155)

LISSOO WARRIORS ARMED WITH THE CROSSBOW (SEE PAGES 146 AND 155)

A BRIDGE OF CANE AND LIANAS ACROSS A TRIBUTARY OF THE SALWIN IN THE LAND OF THE CROSSBOW

wash and who smeared their faces with grease and filth; this was perfectly true of the inhabitants we were now meeting.

The food question, however, was the most difficult for us to solve, and on November 9 we stopped at the considerable village of La-tou-wa-dé (4,500 feet) to endeavor to raise supplies. Here all the people, men, women, and children, were dressed in hempen garments of pure Lissoo style; none of them spoke a word of Chinese or acknowledged any sort of Chinese or other authority. They had not even a head-man of their own. They were, however, willing to trade, and suggested that Mr Litton and I should barter our breeches for a bag of rice, but, as we had only one pair in serviceable condition, we could not accede; but a Chinese coolie who was with us did a deal with one of his ragged and lousy jackets, which he bartered for some maize and salt.

Cloth was the object in greatest demand, but unluckily we had none to spare; therefore one skinny chicken, a few pounds of bad rice and maize, and two bamboo tubes full of honey were all we could get from this village of thirty houses, and even this purchase upset the local market.

Beyond La-tou-wa-dé the country became wilder at every step. We were able to do a good long march of 11 miles, mostly along the river, here broken by many rapids and under beetling cliffs, to an opening in the mountains, where, above some padi patches, is situated the picturesque village of Chong-wa. The few inhabitants fled at our approach, but we captured one, and through kindness shown to him managed eventually to coax some of the bolder spirits back to our camp. We found they had feuds with all their neighbors, and were afraid to guide us a mile in any direction, unless we were anxious to attempt a little-frequented pass which, they declared, led up from their village in three days' march to some friendly Lissoo villages on the other side of the Irrawadi divide. Our chief object, however, was to reach a point farther north, whence it would be possible to get an extensive view up the Salwin, and thus discover the general geographical features of the country.

WHERE FIREARMS WERE UNKNOWN

Learning of the existence of a rope bridge across the Salwin a few miles farther on, we decided to cross the whole party to the other side, where, we were told, the villages were larger and more civilized, and that there were passes eastward over to the Mekong. Luckily we found a native of the important village of Lo-ma-di, on the left bank, returning home from the right bank, and he at once volunteered, in consideration of a bead necklace, to fetch his comrades with the ropes and runners necessary for crossing our party, which consisted in all of 35 persons and a dog.

Meanwhile the people of the village on the right bank, where we were camped, had heard of our arrival, and came down to see us, and a wild lot they were. It then appeared there was a feud about this rope bridge between the two villages on the right and left banks respectively, each party claiming that the right and profit of assisting travelers across belonged to them alone. We offered to give an equal present to both parties, but when our friends from the left bank returned with the runners we saw at once we were in for a serious disturbance. The right-bank party was led by a bullying savage, who shouted that the left-bank party should not help us across. The lefts had rashly left their weapons on the other side, but proceeded to tie up one of our loads for the passage; whereupon the leader of the rights whipped out a poisoned arrow, ran back along the path several paces, fitted it in his bow, and shot it over our heads into the river—a sign, like Mr Snodgrass taking off his coat, that he was about to begin.

As we were all crowded on a narrow path, near a tree to which the end of the rope bridge was secured, and the bellicose Lissoo was about to draw his bow again with an arrow in it which might find a billet in the body of any of us, the situation was critical. Mr Litton and I at once rushed him, and I fired several

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shots from my Winchester repeater over his head at a boulder on the other side of the river. The effect of seeing the bullets smash against the stone at such a distance was immediate, and then, through our interpreters, we told the man and his friends that if they made a show of stringing their bows again the next bullet would find a resting-place in some of their carcasses. They had little, if any, idea of firearms, and they at once subsided into an awe-struck silence; but still we had to stand on guard, and at intervals give exhibitions of our marksmanship and the power of our weapons, till all our party had been safely hauled across the rope to a sand bank on the opposite side, where we pitched camp, together with our friends from Lo-ma-di, who expatiated on the savagery of the low people who lived on the right bank, congratulated us on the manner in which they had been suppressed, and promised us a hearty reception at their own village next day.

Early the next morning we ascended steeply from the river through carefully cultivated patches of maize, millet, and buckwheat to 6,500 feet, when we came in sight of Lo-ma-di. Our friends of the previous day and a number of their friends were now with us, and, though all armed to the teeth, were most amiable and childishly delighted with our firearms, our clothes, and the pointer dog.

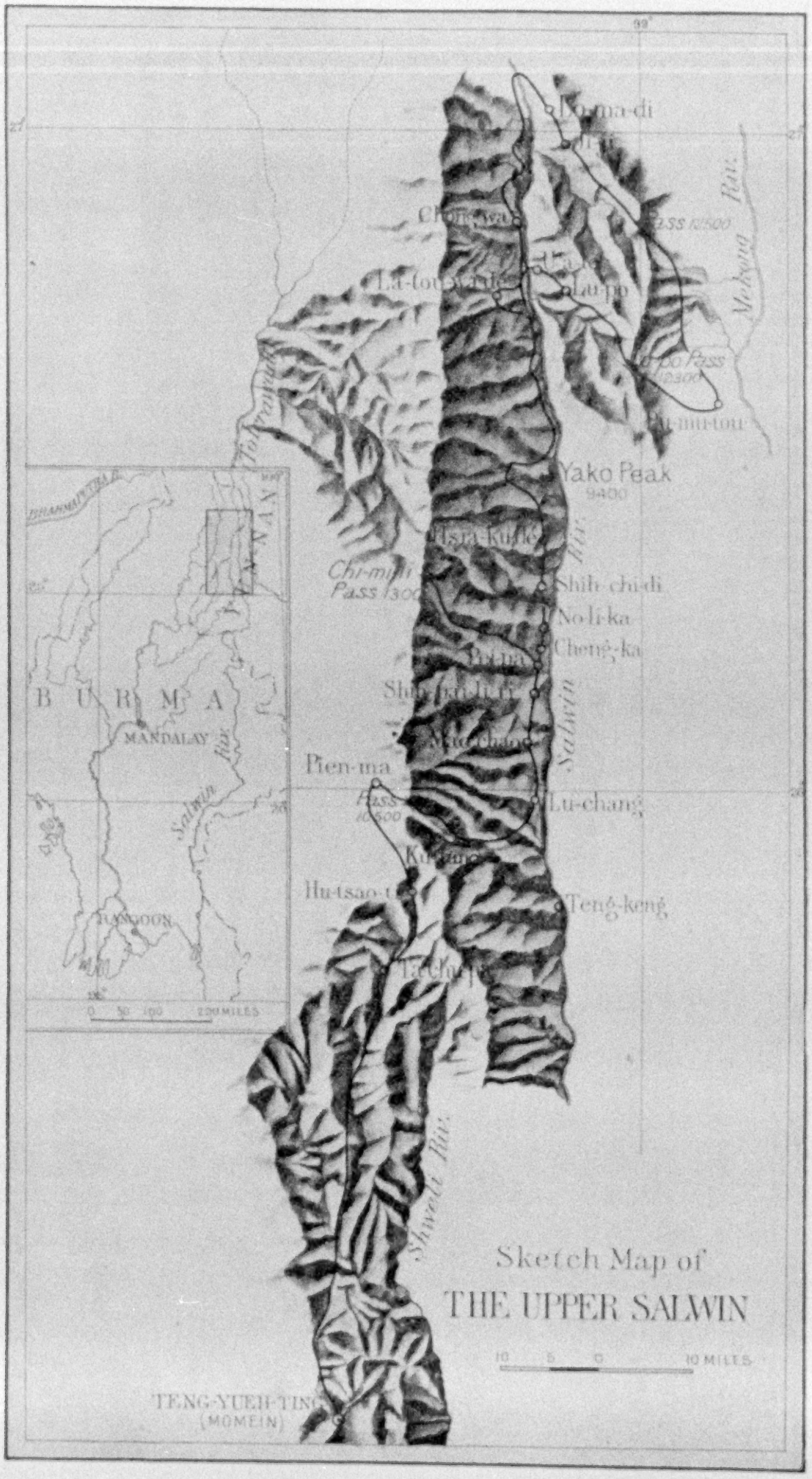
What was most interesting to us was an extensive view we obtained from that point looking straight north up the funnel-like valley of the Salwin. As far as the eye could reach we could trace the almost direct north-and-south course of the river, and the succession of ridges falling down from the high ranges to the river from the east and west divides in a manner so regular as to suggest the ribs of a huge skeleton.

We found Lo-ma-di the largest, cleanest, and best built Lissoo village we had yet seen: some 90 households were scattered along a broad slope at an altitude of 6,500 feet, looking down on the Salwin more than 2,000 feet below. Groves of pine and fruit trees gave grateful shade, and the small garden plots were divided by neat bamboo fences. The picturesque inhabitants, with their beads, cowries, silver ornaments, and long hempen garments, came out *en masse* to welcome us, and several of the village elders brought trays of rice, eggs, vegetables, etc., which they offered on their knees. We met several Chinese-Minchia traders from the Mekong; they bring cotton cloth, opium, salt, and goats, which they exchange for local produce, the staple being a varnish produced by tapping a varnish tree similar to one which is known in the province of Kwei-chou. Beeswax, some drugs, and a small supply of gold dust are also exchanged. Trade with the Lissoo, we were told, is a profitable but risky matter, as there is no sort of government in the country, and even the comparatively civilized tribes on the left bank of the Salwin are continuously fighting among themselves.

The attentions of the Lo-ma-di crowd became so embarrassing that we resolved to push on into the mountains. Marching southeast by an excellent path through oak scrub, we halted for the midday meal at the hamlet of Ji-Ji, situated at 7,200 feet on an open, wide ridge commanding extensive views down the mountain ranges to the south.

AN ARMY CORPS OF CROSSBOW WARRIORS

The men of Ji-Ji were at war with the people of a neighboring village higher up the hill, and we had the pleasure of watching the progress of the fight during our tiffin. The cause of the trouble was the theft of some maize, and a whole army corps, consisting of some fifty warriors, had been mobilized. These fellows, with their grotesque ornaments of silver, deers' horns, pebbles and cowries, their blackened faces, their flowing hempen robes, their war-bows 5 feet broad, their war-swords 5 feet long, and their broad ox-hide shields 5 feet high, moving in a line beyond their village, presented an image of the "pomp and pride and circumstance" of war. The enemy occupied a position higher up the hill and a fierce bombardment of oppro-



Sketch Map of
THE UPPER SALWIN

brious epithets was maintained, but neither side got farther than swearing and stringing bows until the time arrived for the afternoon meal, when the combatants dispersed to their respective homes.

Ji-Ji was the last village on the path leading up to the Mekong-Salwin divide, which we now determined to cross. On the evening of November 13 we made good way into the mountains, marching along an easy but narrow path through woods high above a feeder of the Salwin. Camp was pitched 4 miles from the river, under a large rock overhanging the path, which gave the men some shelter from the damp of the forest, and early next day we negotiated the pass.

Crossing the head of the stream, above which we had marched the day before, a long and steep but not difficult ascent through bamboo and pines brought us out on an open alp at 10,500 feet. Hence a climb by a rocky path took us up on to a bare, wind-swept col which forms the pass at 12,500 feet, 20 miles from the Salwin.

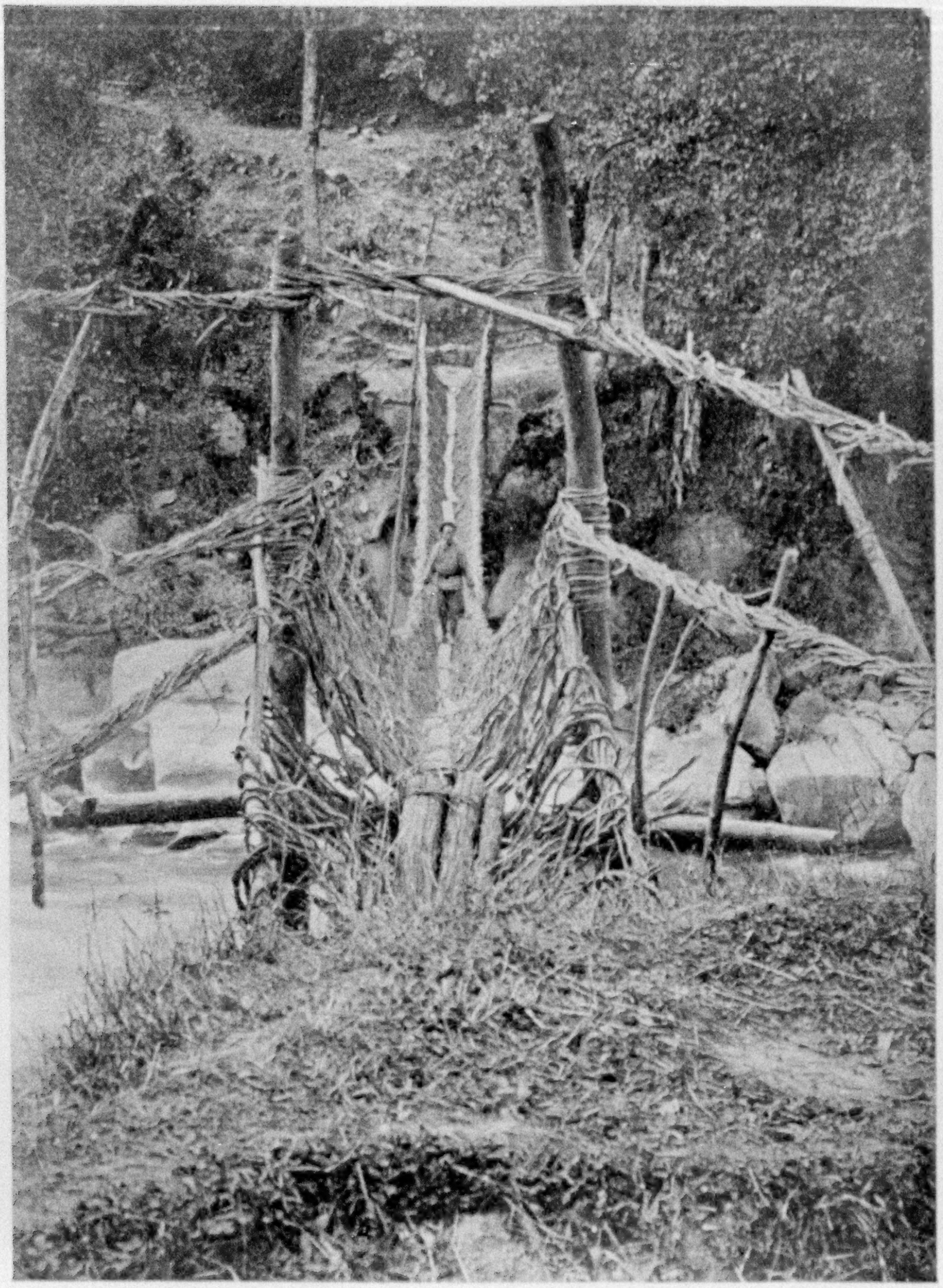
Unluckily mist was being blown along the ridge and this obscured our view, but several bare limestone peaks were seen, rising 1,000 to 2,000 feet above the pass. The men were all benumbed by the intense cold, and at the first sheltered spot, some 500 feet below the summit, we lit a roaring fire of bamboos and enjoyed, so far as the mist allowed us, an immense view of the Lichiang and Tali prefectures beyond the Mekong. In the afternoon we got on to a convenient but steep spur and made rapid progress down toward the Mekong; we camped in a wood at 9,400 feet after a march of 15 miles. We were over 5,000 feet above the Mekong and some 20 to 25 miles north of the Chinese market of Ying-pan, situate on the left or east bank of the river. This is a salt bazaar and the center for all the petty trade between the Minchia inhabitants of the Mekong and the wild Lissoo, and there we intended to replenish our exhausted commissariat.

Turning south we found an excellent high-level road, by which, on the afternoon of November 16, after a 25-mile march, we reached the mud-built Minchia village of Pu-mu-tou, 7,500 feet altitude, from which Ying-pan bazaar could be seen dimly across the river far below us.

The people of Pu-mu-tou, at first apprehensive that we had something to do with the Yamen, soon became friendly, and brought fowls, eggs, and a pig for sale. Also some of our men were sent down to the market next day and returned laden with supplies; therefore we were again in a position to face the terrors of the foodless Salwin, and the headman of Pu-mu-tou volunteered to guide us up to the divide by a different pass from that by which we had come on condition that we would not expect him to approach any of the villages of those "terrible, wild Lissoo."

This part of the Mekong differs widely from the Salwin valley in the same latitude. Instead of sharp crags and cliffs of limestone, dense semi-tropical jungles, extensive forests, and wild Lissoos with their poisoned arrows, we viewed a peaceful scene of wide, bare, cultivated slopes of clay or disintegrated sandstone, shelving down in terraces to the river below. The basin of the Mekong at this point is twice the breadth of the Salwin, though the altitude of the latter river is 1,000 feet less. The people, like the scenery, are altogether less wild than on the Salwin. The houses of mud brick are built into village streets, instead of being scattered about over the hillside. Large villages of 50 to 100 houses occupy all the good sites where water is available for rice irrigation.

In customs, dress, mode of life—in fact, in everything but in language and race—these people are, to all intents and purposes, Chinese. They are too far off from their "father and mother," the Lichiang official, to be troubled much by Yamen underlings, Lichiang being distant eight long mountain stages. They live, if not a strenuous, at least a peaceful and not unprosperous life, and, being far more industrious in cultivation and



ANOTHER TYPE OF LIANA BRIDGE IN THE LAND OF THE CROSSBOW, SHOWING APPROACHES AND FASTENINGS

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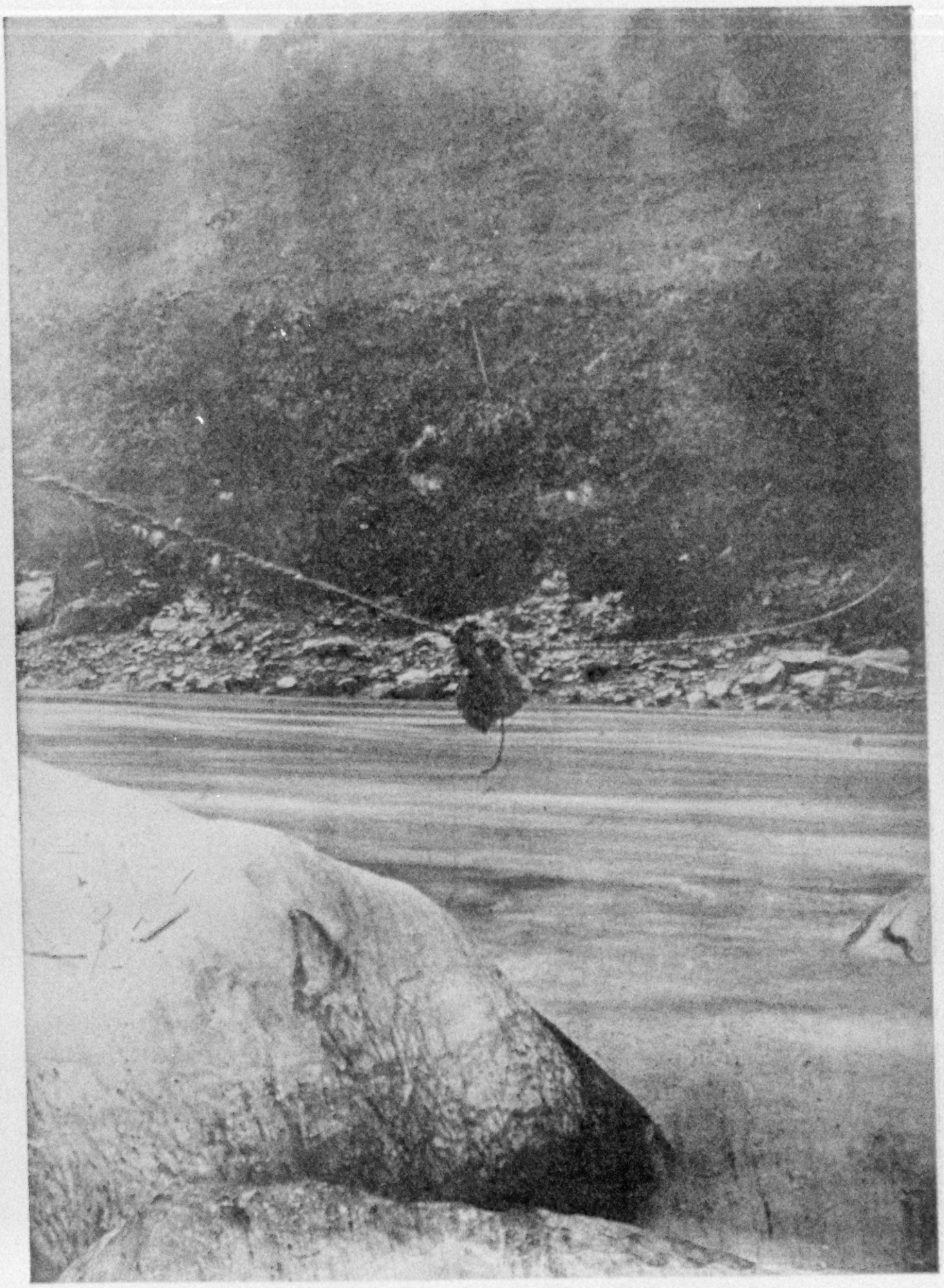
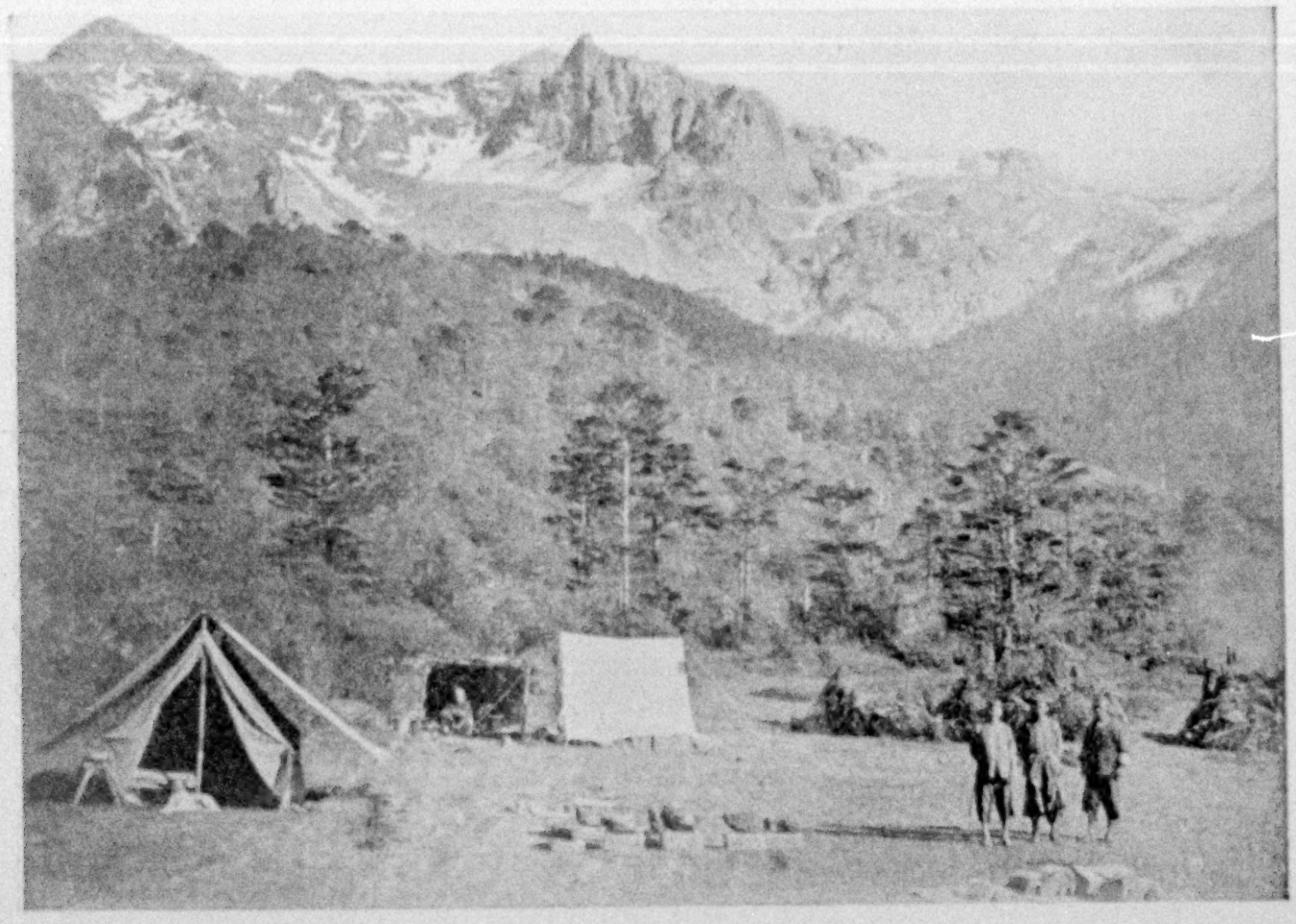


SINGLE-ROPE BRIDGE, OWNED BY THE VILLAGERS OF LO-MA-DI, SHOWING A NATIVE IN THE ACT OF CROSSING; SPAN FULLY 300 FEET (SEE PAGES 140 AND 145)



ONE OF OUR CAMPS IN THE MOUNTAINS AT AN ALTITUDE OF 11,000 FEET, SHOWING THE LICHIANG RANGE

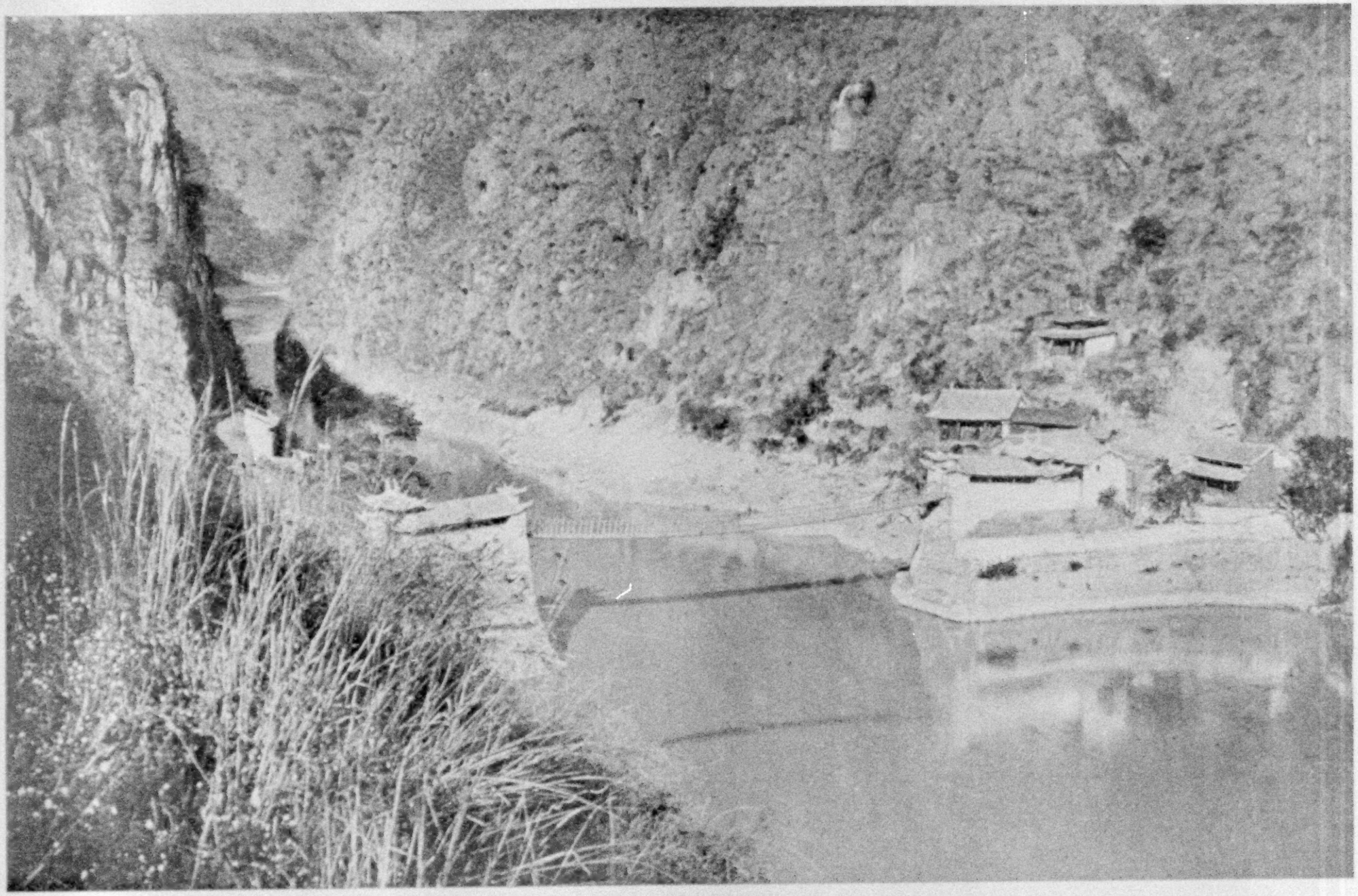
less troubled with clan fights than the Lissoos, are less frequently subject to the ravages of famine.

SUPERB MOUNTAIN RANGES

From Pu-mu-tou we ascended a spur through oak scrub and over grassy slopes, rising in the day's march from 7,400 to 10,500 feet on the slope toward the Salwin divide. At this altitude there was a superb view of all the great ranges of northwestern Yunnan east of the Mekong from Talifa to the borders of Tibet. Most of those northwestern Yunnan panoramas are dominated by the glittering snow mountain of Lichiang.

After an intensely cold night on the mountain side at 10,500 feet, we proceeded on November 19 up the pass, the summit of which we reached at 12,300 feet altitude. Here a surprise awaited us, for the view to the west was perfectly clear, and the whole of the great Salwin-Irrawadi divide was spread out before us. From a little below the pass this range could be followed to the north as far as the eye could reach, until at a distance of about 100 miles from where we stood, and in approximate latitude 28° 30′ north, it was merged in a huge range of dazzling snow-peaks, trending westward. This range is doubtless the east source of the Irrawadi, and forms the divide between it and the Zayal, the Bramaputra system. The upper slopes of the Salwin-Irrawadi divide resemble a vast wall trending most regularly from north to south, and there are no very conspicuous peaks. The average height of the summits in that latitude, 26° 55′ north, would be probably 12,500 to 13,500 feet. There was practically no snow on it in November.

Below the wall-like ridge forming the backbone of the range, limestone spurs, crags, and precipices in bewildering confusion fall down to the Salwin. It was easy to see why the upper slopes of the



SUSPENSION CHAIN BRIDGE ON THE MEKONG RIVER, ON THE MAIN TRADE ROUTE FROM UPPER BURMA TO YUNNAN

It is formed of 12 iron chains and plank roadway 8 feet wide. Breadth of span, 70 yards

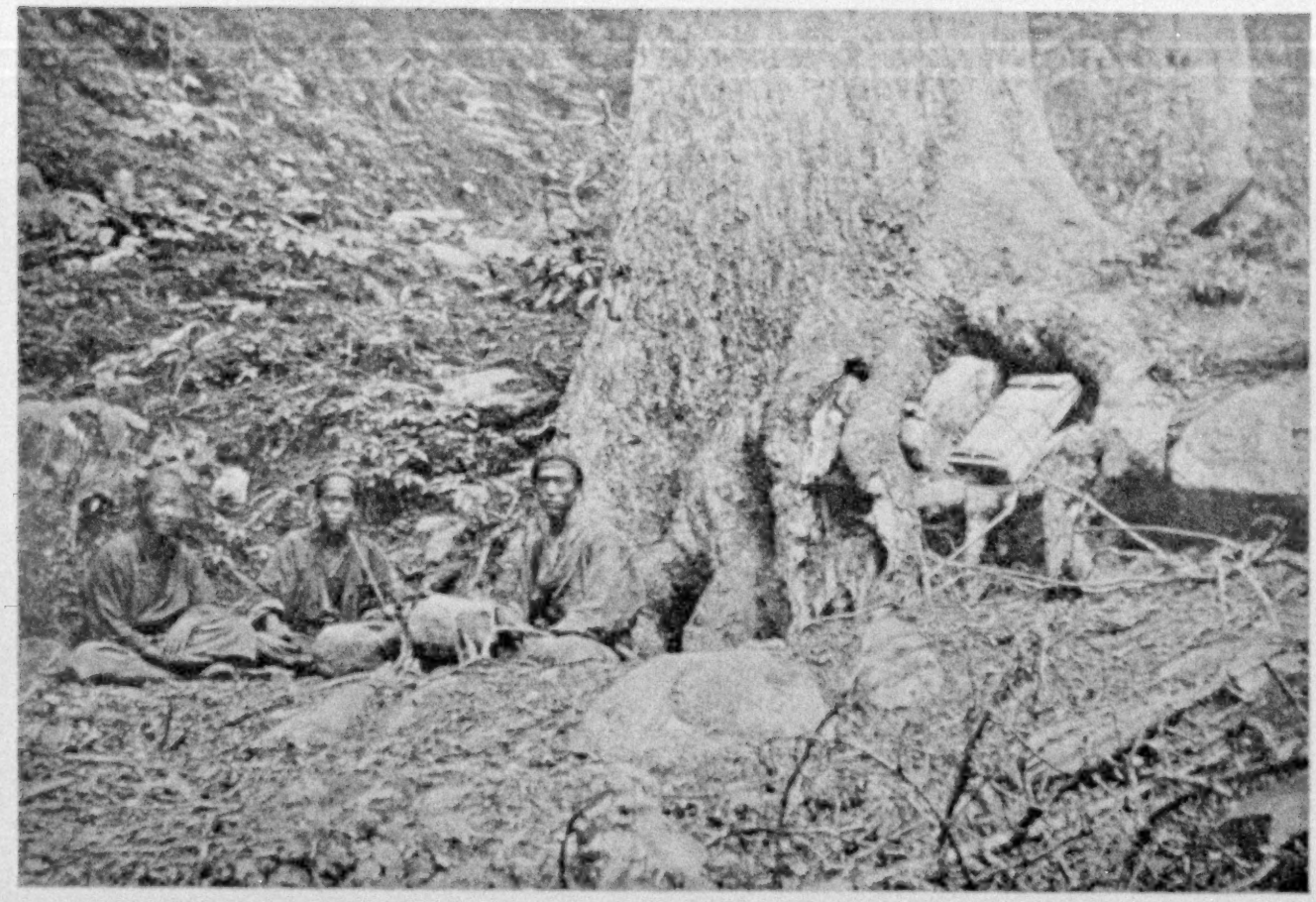
XUM

THREE WOMEN OF PU-MU-TOU (SEE PAGE 148)
The central figure has her arms withdrawn from sleeves to within gown

range are uninhabited, and why this mountain barrier is an ethnographical boundary between the Lissoo and Kachin races.

On this pass, as at many other places on our journey, we saw several mouldering skeletons by the sides of the pathways, victims either of the famine of the previous season or of a savage temper and a crossbow. The Lissoo have a superstitious terror of human remains and give them a wide berth. In the afternoon, after crossing the pass, we made good way along the top of a well-defined winding spur which rose up from the Salwin. Descending to 8,600 feet, we camped at the small Lissoo village of Lu-po, from which place the pass derives its name, after a march of 15 miles.

The next day, when, by a break-neck descent on a slippery declivity, we reached the Salwin at 3,700 feet, near the village of U-a-lo, we found that three of its enterprising inhabitants had just made a rude raft of bamboos, loosely tied together, and were prepared to take our party across. As the *ship* could only carry two men and two loads in a journey, and as the Lissoo do not shine as watermen, the crossing was not completed by nightfall. Next morning the crossing was hurried to a finish, as we were becoming seriously alarmed at the inroads fever was making in our little party, exhausted by the labors of a flying march; two very bad cases had to be carried on the backs of two of our coolies, and our stock of drugs was soon exhausted. Luckily we got through without the loss of a single life, and by forced marches returned to our base camp, near Lu-chang, on December 1, in good spirits if in ragged clothes.



SCENE IN TIBETAN FOREST, ON THE EASTERN FLANK OF THE MEKONG-SALWIN DIVIDE: ALTITUDE, 10,500 FEET

REMARKS ON THE LISSOO TRIBE OF THE UPPER SALWIN

The Lissoo race, if not powerful or very numerous, occupies a large tract of territory. The tribe is undoubtedly an offshoot from the southeast of Tibet, probably before the introduction of Buddhism into Tibet. None of the Lissoo, even those who live among or near Tibetans, shows the least trace of Buddhist influence or belief. Their religious practices closely resemble those of the Kachins, who believe in numerous "nats" or spirits which cause various calamities, such as sickness, failure of crops, etc., unless propitiated in the most suitable manner. The most important spirit is the ancestral ghost. Lissoo graves are generally in the fields near the villages; over them is put the cross-bow, rice-bags, and other articles used by the deceased. It is probably from foundations such as these that the fabric of Chinese ancestor worship was constructed. Food is also placed on the grave for many days. The upper part of the structure is a roughly hewn board, of the shape but larger than a coffin-lid, to protect the articles hanging on the upright post from the weather.

The Lissoo may be said to form practically the whole population of the Salwin Valley from 27° 30′ to 26° north. They have spread in considerable numbers along the mountains between the Shweli and the Irrawadi, and in isolated groups far away down the Burmese frontier and, I am told, into the Shan States.

In parts of Burma, under British rule they have been found readily amenable to civilization and are more docile than the Kachins. But those whom we saw on the upper Salwin were utter savages.

Most of the villages have not even a regular head-man; nearly every village, too, speaks a different dialect, and two Lissoo sepoys from the Burmese frontier below Tengyueh, whom we had with us, could not make themselves understood beyond 26° 30′ north. There are also

a number of tribal subdivisions—a source of constant feuds. The Chinese official theory that the country belongs to the hereditary Minchia chief "Lo," who resides at Tu-wo, latitude 26° 8′ north, on the Mekong, has no foundation whatever; in fact, on the contrary, no sort of official person would dare to go anywhere near the country.

The villages are nearly all at war with one another; few of the people have ever in their lives been more than a day's journey from their own huts; suspicion, rumor, and terror sit enthroned among those limestone ridges. It is almost impossible to get a guide, and quite impossible to get any accurate information about routes, distances, and such details. None of these wild Lissoo ever seem to have asked whence the River Salwin, which occupies so large a place in their lives, comes or whither it goes, or what is at the back of the great ranges which confine their view of the world. The object of each little community seems to be to keep its neighbors at a distance.

The people are also exceedingly lazy. In the spring they do a few day's work in scraping a patch of soil just large enough to yield subsistence, and in planting their maize, the site of the patch being changed yearly. Then in early October they put in a few day's more work getting in their crop and cutting their hemp, or looking after their tobacco patch. All the rest of their lives is spent in eating, sleeping, and squatting round the hearth, varied by a rare expedition to obtain wood for a crossbow, poison for their arrows, or a stock of salt or wild honey. Under these conditions it is not surprising that, in spite of the sparseness of the population and the great extent of land suitable for maize and other cultivation, famine is of frequent occurrence.

WILD HONEY FOR FOOD

Rice is a luxury; coarsely ground maize, buckwheat, and wild honey are the staple food of the people. Where we passed along there were practically no domestic animals or fowls, as they had all been killed during the famine of the previous season. Wild honey as a change is an agreeable sweetmeat, but after a few days constantly partaking of it the European palate rejects it as nauseous and almost disgusting. Our experience extended over a fortnight, during which period our food consisted solely of it and maize. It has escaped the Biblical commentators that one of the principal hardships that John the Baptist must have undergone was his diet of wild honey.

A draughty hut of rickety logs and bamboo matting, consisting of one room 15 to 20 feet in length and 6 to 8 feet in breadth, the whole raised 3 to 4 feet above the ground on piles, and provided with a verandah and a stone hearth in the middle of the floor—such is the true Lissoo hut. The roof is thatched with grass. A large iron pot, a few wooden bins or bamboo baskets to hold grain, and some bamboo tubes to hold water or honey, with occasionally a few rude stools and a rude loom for weaving their hempen garments—such is the furniture which supplies the Lissoo in his simple life.

THE CROSSBOWS ARE VERY POWERFUL

The crossbow is the characteristic weapon of the country and the Lissoo tribe. Every Lissoo with any pretensions possesses at least two of these weapons—one for every-day use in hunting, the other for war. The little children play with miniature crossbows. The men never leave their huts for any purpose without their crossbows; when they go to sleep the "nukung" is hung over their heads, and when they die it is hung over their graves. The largest crossbows have a span of fully 5 feet and require a pull of fully 35 pounds to string them. The bow is made of a species of wild mulberry of great toughness and flexibility; the stock, some 4 feet long in the war bows, is usually of wild plum wood; the string is of plaited hemp and the trigger of bone. The arrow, of 16 to 18 inches, is of split bamboo, about four times the

thickness of an ordinary knitting needle, hardened and pointed; the actual point is bare for a quarter to one-third of an inch, then for fully an inch the arrow is stripped to half its thickness, and on this portion the poison is placed.

The poison used is invariably a decoction extracted from the tubers of a species of aconitum which grows on those ranges at an altitude of 8,000 to 10,000 feet. The poison is mixed with resin or some vegetable gum to the consistency of putty, and is then smeared on the notched point. The "feather" is supplied by a strip of bamboo leaf folded into a triangular form and tied in a notch at the end of the arrow, with the point of the angle outward. The reduction in thickness of the arrow where the poison is placed causes the point to break off in the body of any one whom it strikes, and, as each carries enough poison to kill a horse, a wound is invariably fatal. Free and immediate incision is the usual remedy when wounded on a limb or fleshy part of the body, but at Cheng-ka the uncle of the Lao-wo chief showed us a preparation which resembled opium dross, and which he said was an effective antidote. Its nature and preparation is a secret known only to the prophets. We saw one man at Cheng-ka who had been wounded through the fleshy part of the arm in a fight, and through the use of the remedy had quite recovered, but in its passage the head of the arrow had not broken off.

The marvelous Chinese stories which one hears of the Lissoo have to be taken with a good deal of salt. The Lissoo are not a fighting people, and, with few exceptions, seemed to us to be arrant cowards, but the crossbow and poisoned arrow is certainly a most diabolical weapon. An arrow from a war bow will pierce a deal board an inch thick at 70 to 80 yards; some of my servants were so expert that they could hit a mark 4 inches in diameter repeatedly at 60 to 80 yards. As no one goes anywhere without his crossbow and his bearskin quiver full of those poisoned arrows, and as every village is at feud with every other, mutual suspicion, of a nature to absolutely prevent social intercourse, is inevitable.

In open fight the Lissoo are usually careful to keep at a respectable distance from each other and behind their three-sided ox-hide shields; these protect the whole body, which is still further safeguarded by a heavily-padded cloth belt extending from the breast down to the hips. But if battle is rare, murder and sudden death by ambush in the jungle are common. The Lissoo has all the lack of self-control which marks the savage, and it is so easy to bend down, string a bow, and send an arrow into any one with whom one has a difference. I can recommend any traveler who falls in with a tipsy or bellicose Lissoo with a crossbow to shoot first and argue afterward. The first step in civilizing these people would be to deprive them of their horrible weapons.

The wild Lissoo are much addicted to strong drink; they make a fermented, not a distilled, liquor out of millet or maize, which resembles strong Japanese saké. They are so improvident they habitually use for wine grain which is required for food.

We were able to lift a corner of the curtain which has hidden them hitherto from the outer world, and I think they may in future be safely left to enjoy in obscurity their dirt, their fever, their limestone ridges, their poisoned arrows, and their wild honey.

THE GREAT NATURAL BRIDGES OF UTAH

By Byron Cummings, University of Utah

WE used to be much interested in the descriptions and illustrations in our readers and geographies of the Natural Bridge of Virginia. People travel from all parts of the world to behold this strange natural phenomenon and enjoy the picturesque scenery of the Appalachian Mountains, and feel well paid for their effort. But Utah is the home of really great natural bridges. She astonishes us with not merely one but half a dozen, any one of which surpasses the Virginia structure in grandeur and beauty. The three remarkable bridges—the Edwin, the Carolyn, and the Augusta—which were discovered in Utah several years ago and described in this Magazine,* are now eclipsed by another more marvelous structure in the same State.

Overlying the southeastern part of Utah are the "red beds"—strata of red and yellow sandstone hundreds of feet thick. For the most part this formation rests in a horizontal position; but in places sections lie tipped at an angle of 45 degrees and more, and great faults have occurred. Ages ago this entire region was pushed upward until it checked and cracked in zigzag lines away from the mountains that were formed by the material from beneath being forced upward through the superincumbent sandstone. Thus came into being the La Sals, the Abahos, the Bears Ears, Navajo Mountain, and the many deep canyons radiating from them.

This process of elevation was a gradual one, and, as the waters from the mountains sought a lower level, they took their courses through these irregular cracks and seams, searching for the ocean, which was then not far away. Their rushing currents and surging eddies wore off the sharp corners, sought out the soft places in the yielding sandstone, digging out deep caverns and recesses in the cliffs, and left behind them a series of graceful curves and fantastic forms that amaze and delight the traveler at every turn. As the formation was pushed upward from time to time, these rushing torrents kept on with their work of smoothing, cutting, and filling until they have produced the deep box canyons so prevalent in this section. Sometimes they widen out into small valleys of rich alluvial deposits and again narrow down to a mere slit between huge masses of cliffs.

This elevation and opening of the formation often left a narrow point of the cliff extending outward for rods around which the stream had to make its way as it rushed onward in its course. The constant surging of the waters against this barrier often found a soft place in the sandstone, where it helped to eat out a half-dome-shaped cave. In a few instances, as the waters swirled around the other side of this barrier, they found a similarly soft place opposite the former and ground out a similar half dome on that side. When in the course of time the backs of these two semicircular caves came together, the waters found a shorter course through that opening and quickly enlarged the archway and smoothed off and rounded into graceful curves the sides of the massive buttresses. Thus a bridge was formed and became a mighty span of enduring rock whose foundations and graceful superstructure were laid by the ages.

THE EDWIN BRIDGE

West of the Bears Ears in White Canyon and its tributary, the Armstrong, are three large bridges that have thus been carved out of the sandstone by the forces of nature. A short distance off from the old "Mormon trail" to Dandy crossing, on the Colorado, in Armstrong Canyon, is found the Edwin or Little

* See National Geographic Magazine, vol. xv, p. 368, and vol. xviii, p. 199.

XUM

THE EDWIN OR LITTLE BRIDGE: HEIGHT, 108 FEET; SPAN, 194 FEET Photo and copyright by S. M. Young
(SEE ALSO PAGE 166)

bridge. It is a graceful structure, as will be seen from the accompanying illustration, having a span of 194 feet and an elevation of 108 feet. The top of the bridge is 35 feet wide, while the arch in the center is only 10 feet thick. Thus these proportions give an impression of lightness that is very pleasing to the eye. Round about are domes and turrets fashioned by the same forces that produced the graceful lines and curves of the bridge, and nestling in a cave worn in the sunny side of the cliff near one end is a deserted cliff-dwellers' village.

Passing on down Armstrong Canyon about 3 miles, you find your way almost blocked by a projecting cliff that towers above you in amazing proportions. On the right and on the left similar cliffs seem to be elbowing you out of the way. At the right, however, you notice that the barrier has been worn away; but this is many feet above where you now stand and plainly marks the course of a mighty stream that once forced its way among these cliffs.

Continuing on down the bed of the present-day stream, now nearly dry, you find a few rods farther on that you have reached the end of Armstrong Canyon and stand in the shadow of a vast archway which the waters of White Canyon have cut through this barrier that just now seemed to block the course of the Armstrong. This is the Carolyn bridge, a massive archway carved out of the same red sandstone formation and still showing the unfinished work of the artisan in the sharp corners and broken lines of the arch and buttresses. Nature has not yet given the finishing touches to her work, but wind and storm and driving sand will continue to chisel and polish until the lines are all graceful curves, adding greater beauty to this the most massive of the bridges.

The span is 186 feet wide and from the top of the bridge to the bottom of the gorge is 205 feet. The roadway is 49 feet wide and the arch 107 feet thick in the narrowest part, giving such an impression of massive strength and solidity that one marvels at the mighty power of nature's work.

THE AUGUSTA BRIDGE

Turning to the right underneath this arch and passing up White Canyon, winding in and out between lofty cliffs that send out their towers and battlements, and in the hollows of whose seamed and scarred sides are seen the abandoned homes, fortifications, and granaries of an ancient population, after a walk of 2½ miles you stand under the arch of another of nature's wonders, known as the Augusta bridge. It rises before you in graceful proportions 222 feet high and 261 feet between the abutments. The majestic arch is exceedingly regular, entirely spans the canyon, and you can hardly realize that it has not been designedly placed there as a bridge. The thickness of the stone arch is 65 feet and the roadway is 28 feet wide.

The Augusta, therefore, is the queen of the White Canyon bridges. It combines massiveness with gracefulness of proportions to an extent that gives an altogether pleasing and satisfying effect. Sitting within its shadow and gazing up at the mighty arch curving above, you wonder how many ages it has taken to fashion such a magnificent piece of work. You climb to the cliff above and watch the play of sunshine and shades upon the rich reds and light browns of the sandstone that forms its arch and buttresses and comprehend the gracefulness of its outlines and proportions as a whole, and you seem unable to tear yourself away from the spell of its might and beauty. You feel you would like to take up your abode in one of the ancient cliff dwellings near by and become a child of nature again.

To reach this interesting region people from the north and west should leave the Denver and Rio Grande Railroad at Thompsons and take the stage to Moab, a ride of 35 miles. From Moab one must travel by private conveyance to Monticello, 60 miles farther. At Monticello saddle horses and pack animals can be secured for the trip of 50 miles over Elk Ridge to the bridges. Parties coming from the east or south should leave the railroad at Mancos, Colorado, taking

THE AUGUSTA BRIDGE: HEIGHT, 222 FEET; SPAN, 261 FEET Photo and copyright by S. M. Young

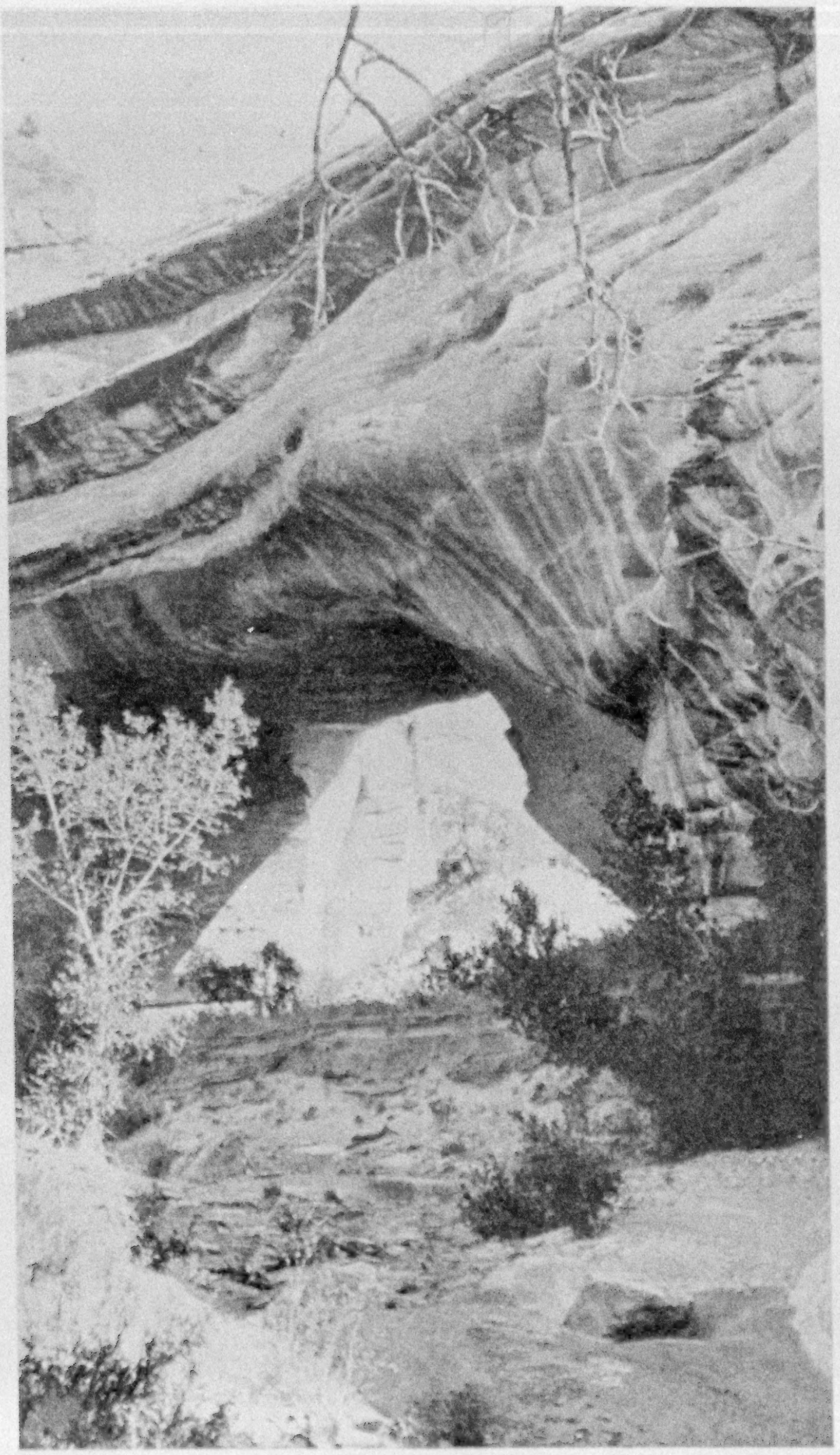


Photo and copyright by S. M. Young

THE CAROLYN BRIDGE: HEIGHT, 205 FEET; SPAN, 186 FEET

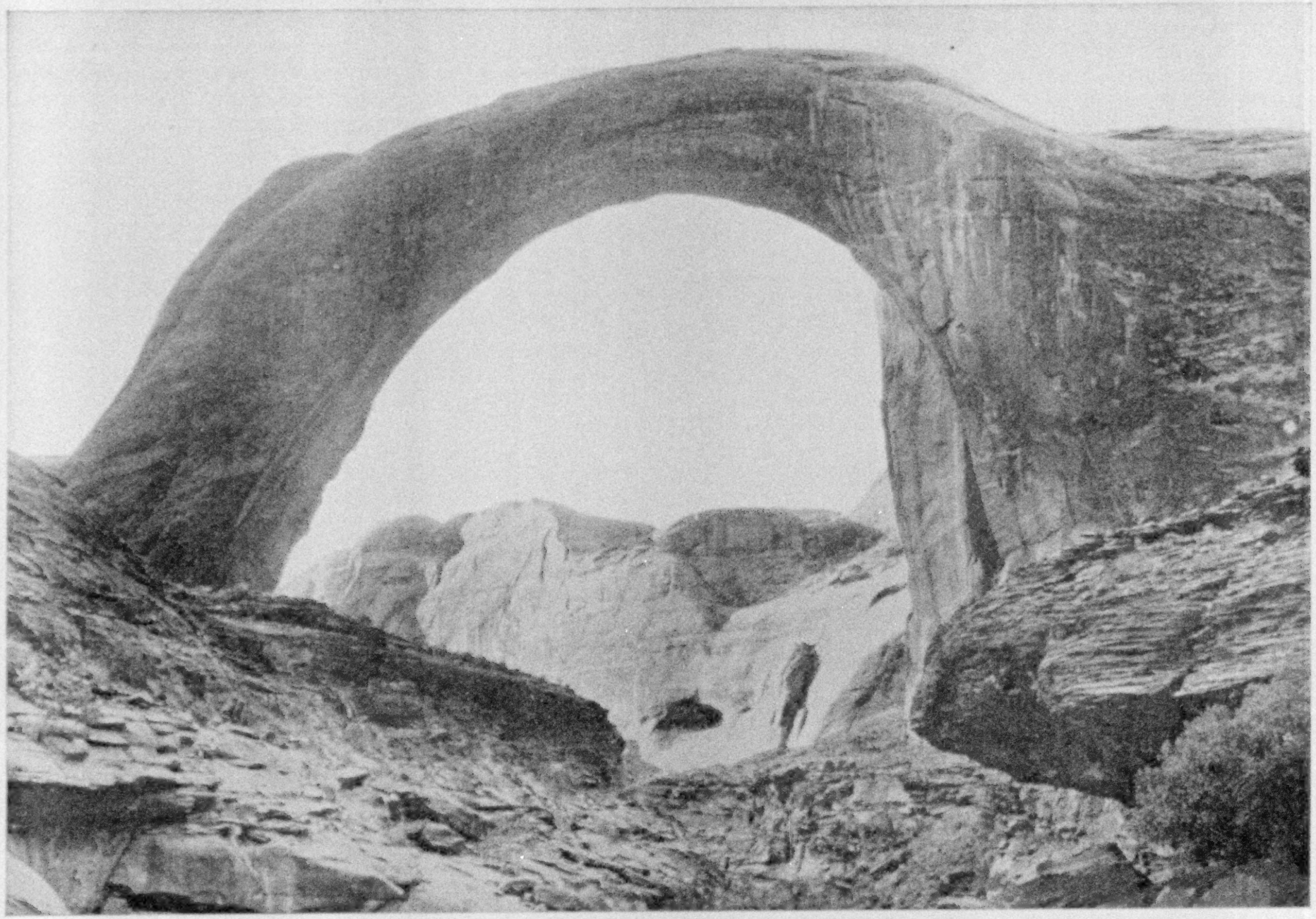


Photo and copyright by S. M. Young

THE GREATEST NATURAL STONE ARCH KNOWN—THE NONNEZOSHI ARCH: HEIGHT, 308 FEET; SPAN, 275 FEET

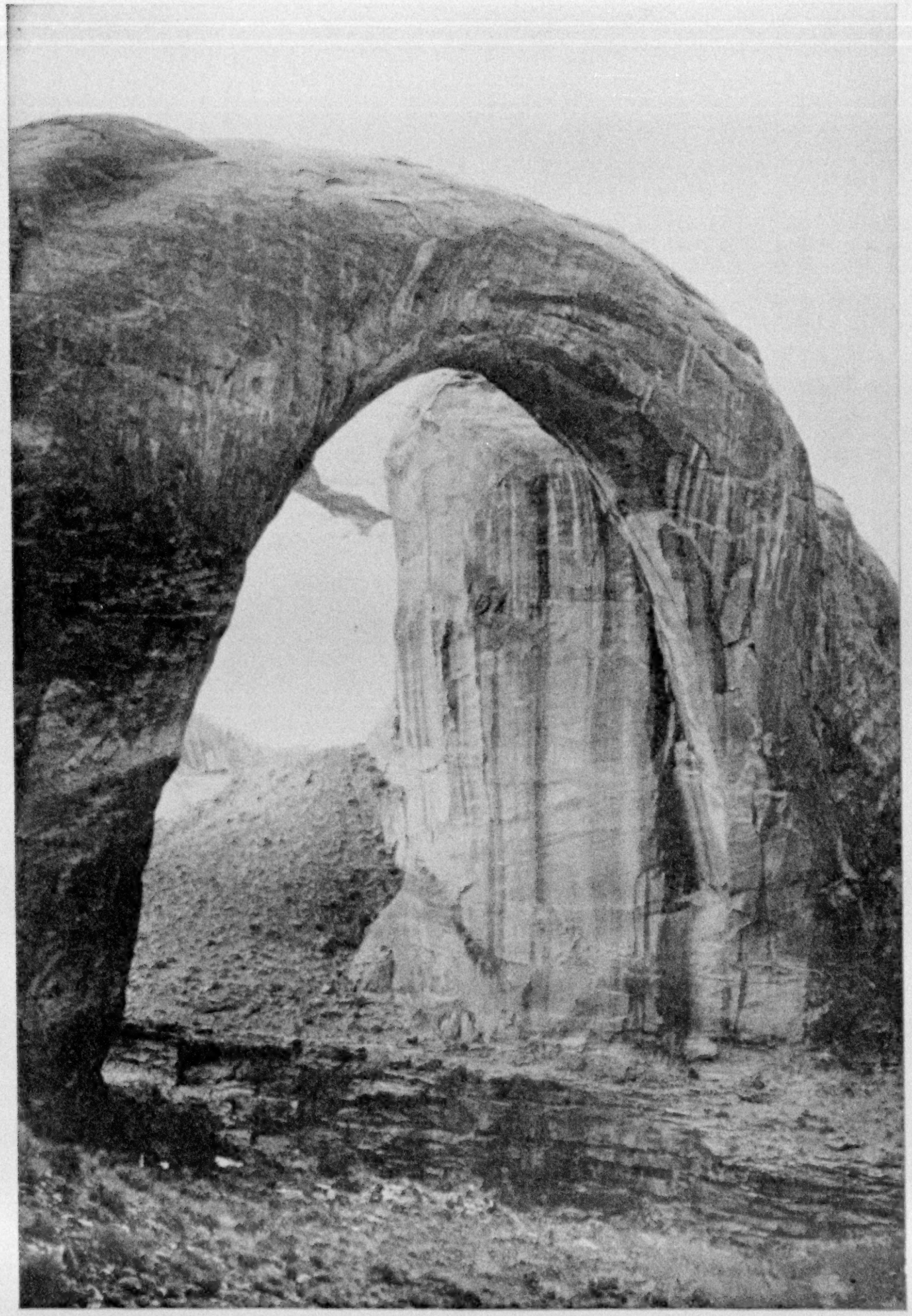


Photo and copyright by S. M. Young

ANOTHER VIEW OF THE NONNEZOSHI ARCH

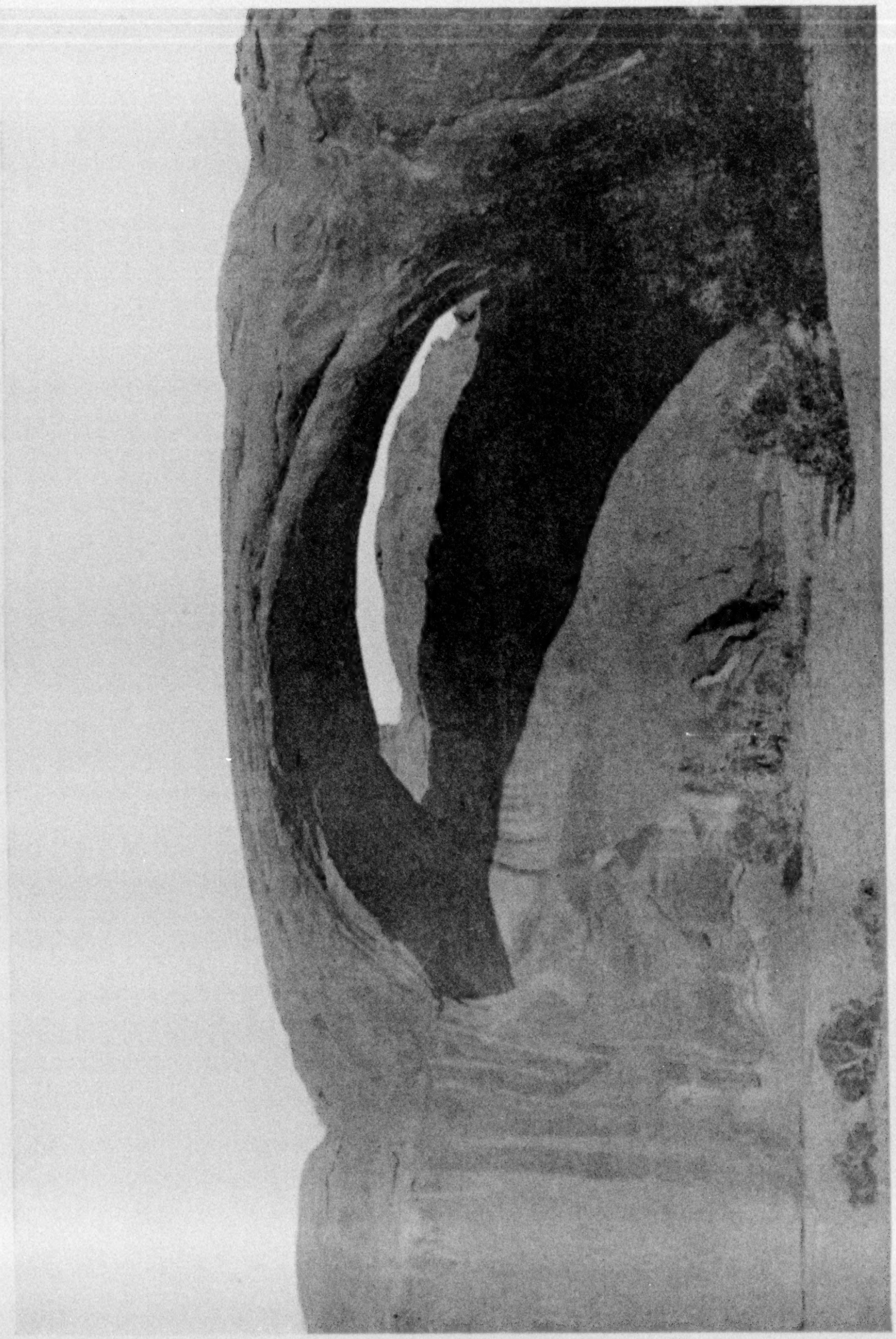


Photo and copyright by S. M. Young

THE PRITCHETT VALLEY BRIDGE NEAR MOAB: HEIGHT, 49 FEET; SPAN, 122 FEET

the stage to Bluff, a distance of 75 miles. From Bluff one must travel with saddle and pack animals 55 miles northwest to the bridges. Both these routes seem long, hard trips by stage and on horseback, but if one enjoys outdoor life every hour of the trip will be a delight and the atmosphere will prove a veritable "fountain of youth."

THE LARGEST NATURAL BRIDGE KNOWN

By going down the San Juan River from Bluff 25 miles to the new oil town of Goodridge and crossing the river over the new steel bridge now nearly completed, and then taking a southwesterly course of about 50 miles across the country, one may visit the recently discovered natural bridge known to the Indians as Nonnezoshi (the stone arch).

This is the largest natural arch yet found and measures 308 feet in height and 275 feet between the abutments. It extends from a bench on one side across into a cliff on the other and hence spans the canyon in which it is found. This canyon, called by the Indians Nonnezoshi-boko, extends from the slopes of Navajo Mountain northwest and joins the Colorado River a few miles below the mouth of the San Juan. It is a deep, irregular gorge, in places so narrow that one has to walk in the stream in order to make his way along its course. The arch is situated about 6 miles above the mouth of the gorge in an exceedingly picturesque and beautiful part of the canyon.

This region formerly belonged to the Navajo reservation, then was segregated and held open to entry for a time, and now is included in that part of Utah recently set aside as a reservation for the Pahutes. It is seamed by deep gorges extending north and northwest toward the San Juan and the Colorado and broken by high cliffs and stretches of smooth, steep sandstone, so that it is almost impenetrable.

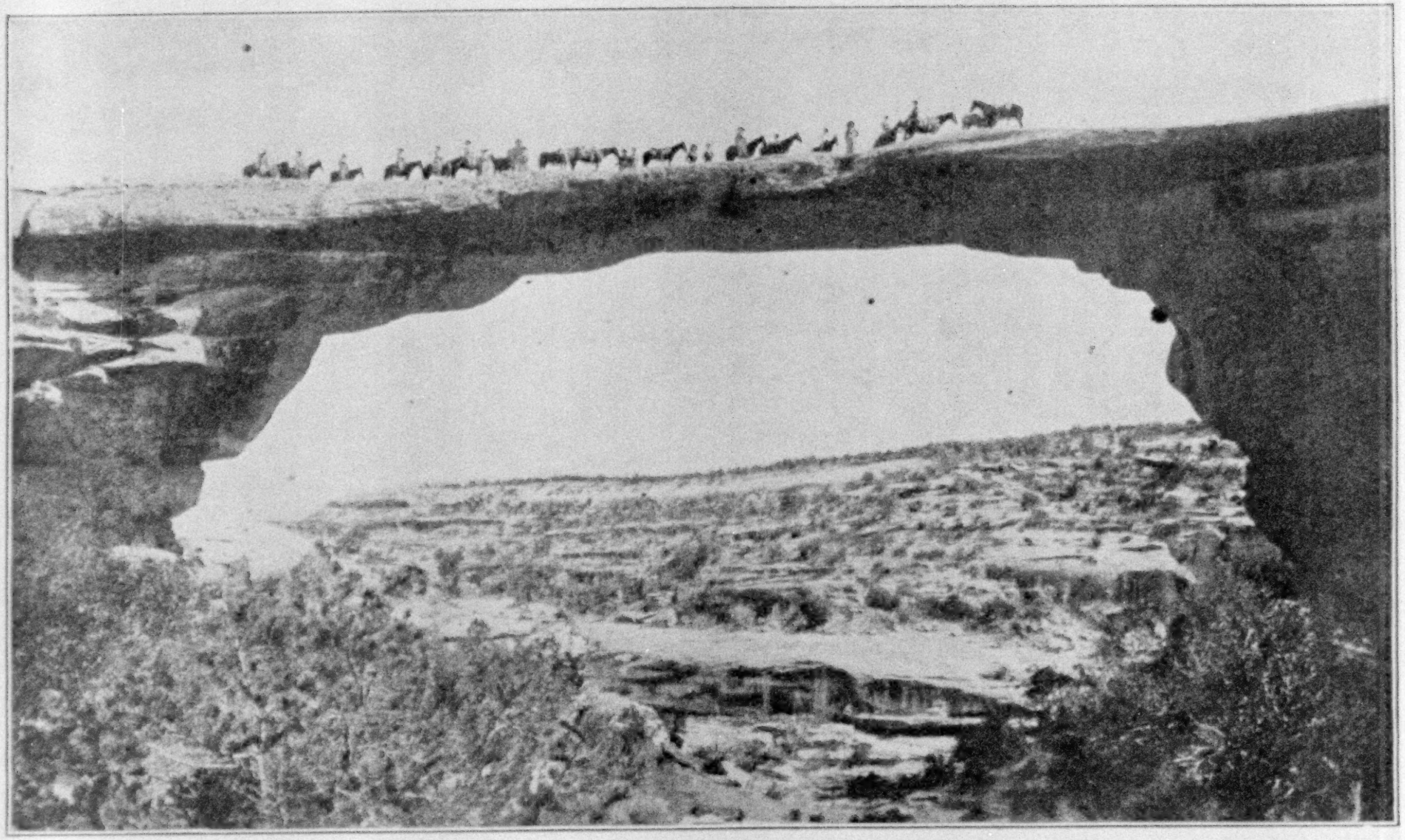
Few even of the Indians are well acquainted with this region. It is celebrated as the place where Hoskinimi, one of the most revered leaders among the Navajo, successfully evaded Kit Carson, in 1866, when the latter taught the Navajo such a terrible lesson; but not even Hoskinimi seems to have penetrated as far as the Nonnezoshi. The members of the Utah Archeological Expedition and of surveying party of the U. S. General Land Office, who visited the bridge together August 14, 1909, are evidently the first white men to have seen this greatest of nature's stone bridges.

As shown by the accompanying illustrations, this remarkable freak in the earth's crust is hardly a bridge in the true sense of the term, but is more properly an enormous flying buttress that has been chiseled out by the ages and left as a specimen of the handiwork of the Master Builder. The surface formation of this section is the same thick bed of red and yellow sandstone found in the region of White Canyon, and Nonnezoshi has been cut out of the cliff in the same manner that the White Canyon bridges were formed. It is a graceful arch, looked at from any position, and is only about 20 feet thick in the narrowest part.

This slender arm of the cliff stretches out across the canyon like a rainbow. In its shadow on the bench at one side are the remains of what was probably an ancient fire shrine. One can easily imagine a group of cliff-dwellers gathered around the sacred fire with offerings to the Sun Father and the Earth Mother. The Pahutes look upon it with awe, and Mr C. A. Colville, who took a party there in November, tells us that their Pahute guide, Whitehorsebiga, would not pass beneath the arch because he had forgotten the prayer that must be said before doing so.

On the slopes of Navajo Mountain you pass two smaller arches that would each be an attraction by itself were they not overshadowed by the grander Nonnezoshi.

In Pritchett Valley, 12 miles by trail southeast of Moab, in Grand County, is a stone arch that plainly has been formed in a different manner from those above described. All about this valley the



THE EDWIN NATURAL BRIDGE: SAN JUAN COUNTY, UTAH Photo and copyright by Chas. Goodman

Span of arch, 194 feet; height of arch, 98 feet; thickness of arch at keystone point, 10 feet; total height, 108 feet; width of roadway on top, 32 feet (see page 158)

thick red and yellow stratum lies on the surface and stands out in weather-worn domes and spires that remind one of an ancient Moslem city.

In numerous places over these bare cliffs large cisterns have formed, into which rush the waters from the surrounding rocks every time a storm sweeps over this region. It happened that in one place where a cave was worn out of the side of the cliff one of these cisterns formed back of it in the cliff above. Gradually the cistern kept growing larger and deeper and the cave kept extending its area backward inch by inch until the bottom of the cistern broke through into the back of the cave near its floor. The rushing of wind and water with every storm has kept enlarging the opening until the arch of the cavern has become a graceful bridge having a height of 49 feet and a span of 122 feet. There are two other similar structures near this where the cisterns broke through at the back of the caves near the top so that you have the arch in front and an immense skylight at the back. The architect has not yet finished the contract. Here natural bridges can be seen in process of construction.

In Dark Canyon, below the western slope of Elk Ridge, is another arch that has been shaped from the cliff under conditions similar to those that produced the natural bridges in Pritchett Valley. Its span of more than 100 feet forms a regular curve on the side of a slope heavily wooded with pinion and cedar.

The above are the most striking examples of the great natural arches of southern Utah. They should be classed among the world's wonders.

THE SOUTH POLAR EXPEDITION

To the Members of the National Geographic Society:

ON February 1 Commander Robert E. Peary made a proposition to the Board of Managers of the National Geographic Society that the Society and the Peary Arctic Club should together send out an expedition to the South Polar regions to explore the coast of Weddell Sea and, if possible, reach the South Pole via this route. The proposed expedition would leave the United States in August of this year and cross the Antarctic circle about January 1, 1911. Commander Peary offered on behalf of the Peary Arctic Club to place the steamship *Roosevelt,* which it will be remembered was built by the Club specially for polar work, at the disposal of the expedition, provided the Society would assume the initial expense of $50,000. He also proposed that expenses above $50,000 be divided equally between the Peary Arctic Club and the National Geographic Society. He estimates the total expense of fitting out and maintaining an expedition in the South Polar regions for one year at between $75,000 and $100,000.

Commander Peary stated, moreover, that the *Roosevelt* was in very good condition; that she could not be duplicated at present for considerably over $100,000, and that all the equipment of his recent polar expedition, including sledges, fur clothing, and camp equipment, would be placed at the disposal of the party, and that if funds could be found for the expedition Captain Bartlett and the major portion of the members and crew of his last expedition, who were of such invaluable assistance to him in his conquest of the pole, would be glad to take part in the work. He himself was ready to devote his time and energy to planning and equipping the expedition, but could not take command of the party. Captain Bartlett will command the expedition.

Your Board of Managers agreed with Commander Peary that the present is a most opportune time for an American expedition to the Antarctic. A British expedition under Captain Scott will leave England about August, 1910, and spend the year of 1911 in Victoria Land and will attempt to reach the South Pole

SKETCH MAP OF THE SOUTH POLAR REGIONS

from that quarter. Simultaneous observations taken by an American party exactly opposite the English base would be of great benefit to science.

Your Board of Managers referred the matter for consideration to the Finance and Research Committees of the Society. On February 8 favorable reports from these two committees were received by the Society. The following resolution was thereupon unanimously adopted by the Board:

"*Resolved:* The National Geographic Society believes that it is of great importance to science that tidal, magnetic, and meteorological observations shall be obtained at or in the vicinity of Coats Land during the same period that the British expedition under Captain Robert F. Scott, R. N., is making similar observations on the other side of the Antarctic area, 1,800 miles distant, and at the same time that this recently discovered land shall be explored.

"The Society is ready to accept Commander Peary's proposition that it shall undertake jointly with the Peary Arctic Club an expedition to the Antarctic regions, provided that the Board of Managers, after consultation with the members of the Society, finds that the project will receive sufficient financial assistance to warrant the undertaking."

The Board of Managers heartily endorse Commander Peary's project, and, if the resources of the Society were larger, would make an appropriation for the work. All our funds, however, are required at home.

The membership and popularity of the National Geographic Society have been increasing so rapidly that the Association requires additional space for its working force. During the past year the Society has expended about $40,000 in purchasing a frontage of 85 feet on Sixteenth street, with a depth of 90 feet, adjoining its present home. Your Board of Managers propose on this site to erect an additional building which will afford room for the clerical force of the Society and for the future growth of its business. This expenditure will require all of the available funds of the Society.

We realize, however, the unusual opportunity afforded the National Geographic Society by Commander Robert E. Peary for the increase of geographic knowledge of the South Polar regions. We believe not only that the members of the Society should be given an opportunity, but that they should be urged to assist the project.

An American expedition could be equipped at the present time with great economy of money, could benefit by Commander Peary's unequaled experience of polar conditions, and could use the officers and crew picked and trained by him during many years of campaigns on the ice.

As Peary says, "At some sacrifice and cost of time and money on my part, and large cost of money on the part of my friends, a certain capital of experience and equipment has been assembled which has no duplicate, and I feel that it is perhaps a duty not to let that capital be thrown away when a little further expenditure of time and effort will enable it to bring in still greater returns."

As evidence of his desire to see an American expedition despatched in search of the South Pole, Commander Peary has deposited $10,000 in a New York bank as his subscription to such an expedition. This sum had been presented him by Governor Hughes on behalf of the American people February 8 at a large meeting in the Metropolitan Opera House.

No region in the world presents such problems for exploration and the advancement of science as are to be found around the South Pole. Here is a continent greater than the United States and Alaska combined, much larger than Europe, which has been penetrated in only one direction, namely, by Scott and Shackleton from Victoria Land. Even its coast lines are little known. It is believed that the greater part of this continent ranges in altitude from 8,000 to 14,000 feet above the sea, making it probably the largest continental mass above sea-level in the world.

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Planted on the fringe of this vast continent of snow and ice are lofty volcanoes like Terror and Erebus, which are belching continually smoke and fire. Here lives the most remarkable bird known to science, the penguin, which lays its egg on a cake of ice in the blackness of a polar night, when the temperature is not less than 30° below zero, and then holds the egg and chick on its feet until the young bird can take care of itself.

A glance at the map shows the dense pack ice which surrounds the Antarctic area and makes the approach to land so difficult from all directions. But the great engines and heavy frame of the *Roosevelt*, which is more powerful than any vessel hitherto employed in South Polar work, should enable her to pound a path where previous ships have been helpless, and thus to carry the American party to an advantageous base. Exactly where this base shall be cannot be determined until the party get in the ice and find where they can go, but Commander Peary proposes that the American expedition should make its headquarters somewhere on the coast of Weddell Sea, probably in the vicinity of Coats Land, which was discovered by Captain Bruce, of the Scottish expedition, in 1904. It is hoped that a base can be found here less than 900 miles from the pole. The primary object of the expedition would be to plant the Stars and Stripes at the South Pole, but for those who seek a different motive, it should be explained that every mile made from Coats Land to the pole would be over unpenetrated and unknown regions.

This section is probably the least known in the Antarctic area. Bruce succeeded in getting within a few miles of the coast, but he did not land. Ahead of him were ice-clad slopes which he believes ascend to a plateau which may be an extension of Victoria Land. All explorations in this region would be absolutely new discoveries and would benefit geology, zoology, and all kindred sciences.

If the plan of exploration outlined above is put into successful execution we hope it will arouse such interest that our government or an association of scientific organizations, or both in combination, will later undertake the exploration and scientific investigation of the entire circuit of the unknown Antarctic regions, including the exploration of Wilkes Land and the verification of discoveries made 70 years ago.

Campaigning against the pole in some respects is easier in the South than in the North. The weather is much harsher and more boisterous in the South, but the working season is longer. The North Pole is surrounded by an ice-covered ocean, which must be crossed in spring, before the ice breaks apart under the summer sun. The South Pole, on the other hand, is situated on a great ice plateau, which may be traversed during almost the entire period of daylight. Thus, while Peary was compelled to complete his dash from the most northern land to the pole and back in a period of less than 60 days, the South Polar explorer has more than 120 days at his disposal, and even this period can be extended by utilizing Peary's methods and equipment.

WILKES' AND D'URVILLE'S DISCOVERIES IN WILKES LAND

By Rear Admiral John E. Pillsbury, U. S. Navy

In January, 1840, two national expeditions were in the Antarctic, one the United States Exploring Expedition, consisting of four ships, the *Vincennes*, *Peacock*, *Porpoise*, and *Flying Fish*, under the command of Lieut. Charles Wilkes, U. S. Navy, and the other a French expedition, consisting of *L'Astrolabe* and *La Zélée*, under command of Capitaine de Vaisseau M. J. Dumont d'Urville.

It has generally been accepted by foreign authorities that d'Urville sighted the land of the Antarctic Continent, which he named Adélie Land, on the same day (January 19) that Wilkes discovered land 400 miles to the eastward, which he named Cape Hudson, and also that d'Urville's Cote Clarie, in longitude 131° east, was sighted by him the day before it was seen by Lieutenant Ringgold, on board U. S. S. *Porpoise*.

Investigation shows that both of these assumptions are in error, and in fact d'Urville first sighted Adélie Land the day after Wilkes sighted Cape Hudson, and he sighted Cote Clarie the same day that it was sighted by Ringgold, but at a later hour. The story of the investigation which led to these conclusions will be given in the order in which it was made.

In d'Urville's narrative it is stated under date of *January 29* that at 4 p. m. he sighted one of the ships of the American expedition (the *Porpoise*) and he "hoped that she intended to speak us." Through a misunderstanding of the maneuvering of the French flag-ship, Ringgold thought d'Urville wished to avoid a meeting, and, although but "a cable's length distant" from the ship, he put his helm up and stood off to the southward.

Ringgold states that at 4 p. m. *January 30* he sighted two ships which afterwards proved to be the French vessels. He approached them "within musket shot," when to his surprise he saw them making sail, whereupon he hauled down his colors and stood off before the wind.

The discrepancy in dates was not noticed in reading the narratives, but, wishing to see just where the meeting of the ships took place, their tracks were plotted on the same chart, when it appeared that the noon positions (d'Urville's January 29 and Ringgold's January 30) were near each other, and that the tracks crossed in the afternoon.

The discrepancy in dates seems to be remarkable, since both expeditions had crossed the 180th meridian from east to west some months before and had sailed for the Antarctic — one from Hobart Town, Tasmania, and the other from Sydney, Australia, where the dates must have been identical.

We find in Wilkes' narrative, volume 2, page 159, this statement: "On crossing the meridian 180° we dropped the 14th of November, in order to make our time correspond to that of the Eastern Hemisphere, to which our operations were for some months to be confined."

That d'Urville made no change of date in crossing the 180th meridian, but maintained the same chronology, appears from d'Urville's narrative, "Routes des Corvettes," volume I, page 134, where, under date of October 13, 1838, the longitude is given as 179° 31′ west, and on page 136, under date of October 14, 1838, it is given as 178° 53′ east. He therefore made no change of date in crossing the 180th meridian, as otherwise the second date would have been October 15 instead of October 14.

Further investigation of d'Urville's daily positions shows that every day is accounted for until June 22, 1840, which appears in volume 1, page 340. On page

342 appears the date of June 24, with an asterisk, and at the bottom of the page is this note:

"Nous reprenons la date d'Europe,"

so that the date he dropped was June 23, 1840, five months after the visit to the Antarctic and more than twenty months since he crossed the 180th meridian.

This means that in d'Urville's narrative of his discoveries and on the chart of his Antarctic voyage every noon position must have its date advanced one day in any comparison to be made with the noon positions and the discoveries of Wilkes' ships.

Wilkes believed that he sighted the Antarctic Continent on January 16, 1840, at about 158° east longitude. On January 19, however, he states that "land was now certainly visible from the *Vincennes*, both to the south-southeast and southwest, in the former direction most distinctly. Both appeared high," etc.

D'Urville says, in volume 8 of his narrative, under date of January 19 (which should be January 20, to correspond with Wilkes' time), "At 9 a. m. we saw in the E. S. E. a great black cloud, which seemed stationary and had the appearance of a raised island." "Toward 3 p. m., M. Gervaize, who was officer of the watch, thought he saw once more an indication of land in the east." "At 10:50 p. m. this luminary (the sun) disappeared and showed up the raised contour of the land in all its sharpness." This land on January 21 (true date, 22) he named Adélie Land.

Returning now to the meeting of the *Porpoise* and the French vessels. On the day following the meeting d'Urville reports: "At 6 o'clock the man on lookout had sighted the ice pack to the south and I brought the ship to the wind in order to go nearer to explore it. At 10 o'clock we were not more than three or four miles distant. It appeared prodigious. We saw a cliff with a uniform height of 100 to 150 feet, forming a long line westward," etc.

It will be noticed that at 6 o'clock the *ice pack* and not the *barrier* was sighted.

Wilkes' narrative of the movements of the *Porpoise* for this day states: "The beginning of the 31st the gale continued; at 7 a. m., moderating, they again made sail to the westward; in half an hour discovered a high barrier of ice to the northward, with ice islands to the southward; at 10 a. m. they found themselves in a great inlet formed of vast fields of ice which they had entered twelve hours previously; the only opening appearing to the eastward, they were compelled to retrace their steps, which was effected by 8 p. m." "They now found themselves out of this dangerous position, and, passing the point, kept away to the westward."

"February 1.—The immense perpendicular barrier encountered yesterday was now in sight trending as far as the eye could reach to the westward," etc.

The *Porpoise*, therefore, at 7:30 a. m., January 31, was in the entrance of the great inlet on the southeast side of d'Urville's "Cote Clarie," and had sighted the high barrier of ice, the northern side of which d'Urville reached about 10 o'clock the same forenoon.

It is established from this investigation that, even if Wilkes' sighting the Antarctic Continent on January 16 is not admitted, it is certain that he did sight Cape Hudson a day before d'Urville sighted Adélie Land, and that Cote Clarie was sighted by the *Porpoise* on the same day that it was seen by d'Urville, but at an earlier hour.

Wilkes cruised along the coast of this continent for more than 1,600 miles from his first landfall. Future exploration may, and, indeed, probably will, find that much of the land discovered by him was placed too near the barrier, or, in other words, too far north, for it is well known that distance estimated by the eye is liable to great error, and particularly is this the case in the polar regions.

Whether this proves to be so or not, this investigation establishes Wilkes' priority over d'Urville. The English sealer Balleny, in 1839, got a glimpse of land in about 121° east, but all he says regarding it is, "Saw land to the south-

ward." Neither d'Urville nor Balleny had any notion nor made any suggestion that they were on the edge of a continent. Wilkes, on the contrary, not only sighted at frequent intervals some 1,600 miles of this coast, but he recognized that it must be part of a continent. The name he gave to this land, the Antarctic Continent, must belong to the entire continent the existence of which he revealed. Some geographers have recognized that part of Antarctica he discovered needed a special name and therefore gave it the name of Wilkes Land. When it is remembered that Wilkes changed the conception that the Antarctic was an ocean by demonstrating that it was a continent, the least that his discoveries demand is that the name of Wilkes Land be retained on all of Antarctica lying between the longitudes of 95° and 158° east.

THE GREAT ICE BARRIER

By Henry Gannett

IN his notable expedition of 1840 to the Antarctic, James Ross discovered a great ice cliff rising from the sea to an average height of nearly 200 feet and stretching from King Edward VII Land to South Victoria Land, a distance of about 400 nautical miles. Of its origin nothing was known, and, although later expeditions also visited it, they added little to our knowledge. It was not until Scott, in 1902, and Shackleton, in 1907, made their remarkable sledge journeys in the interior of Antarctica that the nature of the Great Ice Barrier became known.

The barrier is simply the southern limit of a great sheet of ice extending southward up a great bay which penetrates the land at least 300 miles and possibly double that distance. Indeed, it is possible that it may extend entirely across, joining with Weddell Sea on the opposite side and dividing Antarctica into two continents. From the barrier southward this bay, with a known area of at least 100,000 square miles, is entirely occupied by this ice sheet. It is bordered on the west by high mountains from which stretches westward a still higher plateau, which reaches an altitude of over 11,000 feet at Shackleton's farthest southern point. The land on the east side of the bay is unknown, except at the point of King Edward VII Land, where the barrier joins it, but it also is probably mountainous.

From the high land on the west side numerous glaciers descend to this field of ice. Notable among them is that by which Shackleton ascended to the summit of the plateau in his wonderful sledge journey toward the South Pole, a glacier 100 miles long and 50 miles wide, with a descent of 8,000 feet. From the east side of the bay, and especially from its south end, probably other great glaciers contribute to the great ice field.

The name "Great Ice Barrier," originally applied only to the ice cliff forming its northern limit, has been extended and applied to the ice field itself, and even to the bay which it covers. It is unnecessary to say that these extensions in the application of the name are inappropriate, and it is to be hoped that suitable names will be selected for these features. I would suggest for the ice field the name of Shackleton glacier, since Shackleton has made the most extensive explorations of it and its surroundings; moreover, I hope to show that it is in truth a glacier, although both Scott and Shackleton refuse to accept that explanation of the phenomenon. It is their belief that it has been formed from snow falling upon its surface much as the sea-ice of the Arctic is formed. But sea-ice nowhere accumulates to any such thickness as this or presents an ice wall at its borders.

XUM

On the other hand, every glacier that reaches the sea presents just such an ice wall. There are scores of such glaciers on the Alaskan coast, and probably hundreds on Greenland, Grant Land, and Spitzbergen, whose fronts extend out into the sea, even into water so deep that they must be afloat, as is much of the barrier.

The snow which falls upon the surface of this ice field could not possibly supply the waste from the barrier, and another source of supply must be found. This supply is in the numerous and large stream glaciers which bring down the ice from the highlands on the east, west, and south of the bay. The area thus drained must be enormous—amply sufficient to maintain the supply.

The fact that this great ice field is moving northward at the rate of about one-third of a mile a year, as ascertained by Shackleton, would seem in itself as a conclusive demonstration that it is a glacier. Sea-ice, unless driven by wind or currents, is quiescent, while the glacier always moves toward lower levels.

Thus Shackleton glacier is a great mother glacier, into which drains the snow and ice from enormous areas of highland. This glacier collects the ice and transports it northward to the Great Ice Barrier, where it is dropped as bergs into Ross Sea.

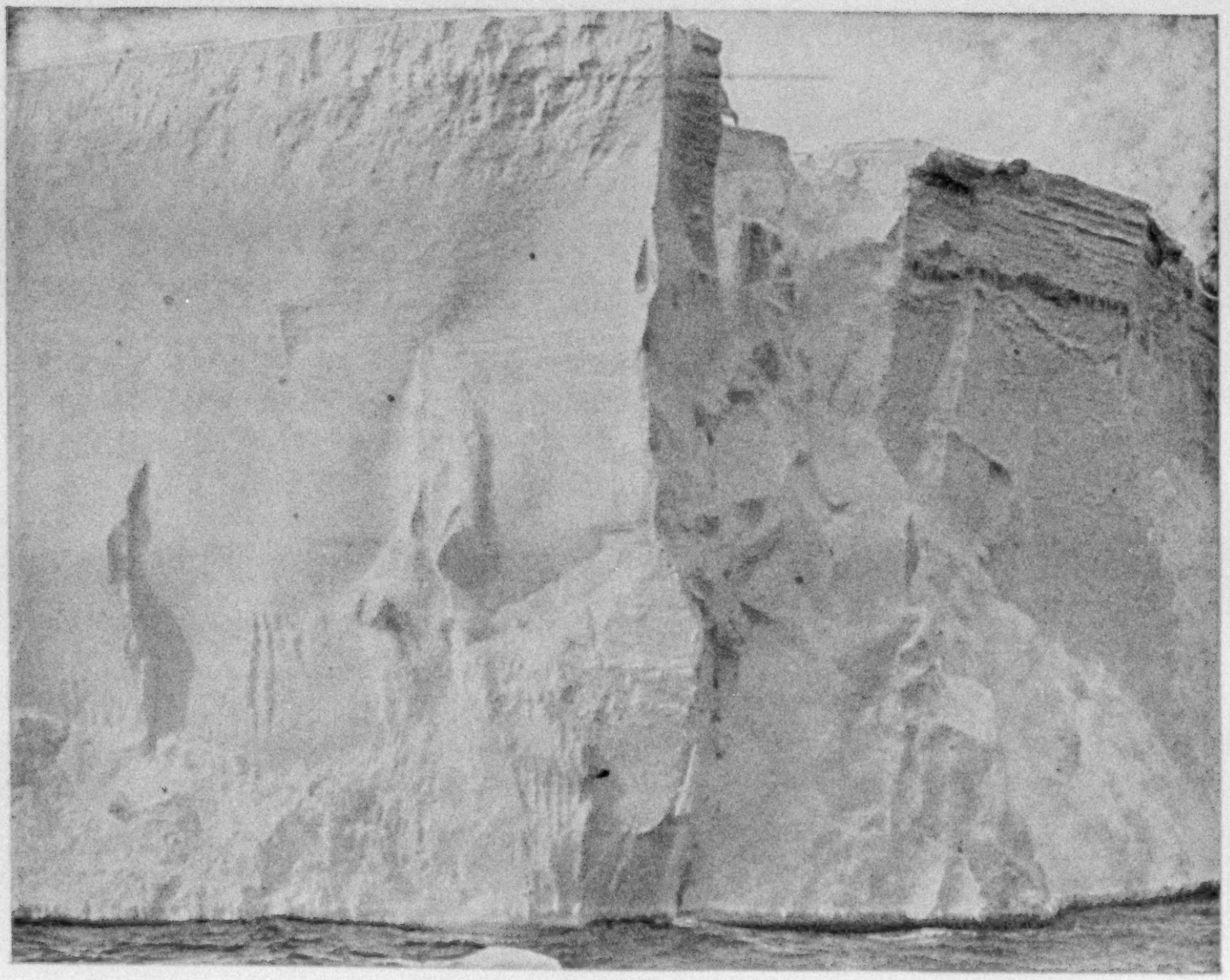

Photo from Capt. Robert F. Scott, R. N.

FRONT OF THE GREAT ICE BARRIER

THE BARRAGE OF THE NILE

By Day Allen Willey

THE most historic and one of the greatest inland navigation waterways is the Nile, the river and its tributaries affording over 4,000 miles suitable for the passage of steamers and other craft between North and East Africa and Cairo.

The head of the navigable waterways may be said to be the town of Gondokoro, on the White Nile, about 1,000 miles above the city of Khartum. Gondokoro is the terminus of several caravan routes extending into the Congo, as well as Uganda and Unyoro. Small steamers ply upon the water-courses between Khartum and Gondokoro, connecting at the former city with steamers for Cairo. In recent years tourists have extended their trips from the Lower Nile as far as Gondokoro, but the rivers are utilized principally for the transportation of products from the territory beyond Gondokoro and to Khartum.

There is one very serious obstacle on the section of the Nile between Khartum and Gondokoro which has at times obstructed the channel so that continuous navigation has been delayed months at a time. This is the vegetation growth known as sudd, which is a translation from the Arabic term El Sett.

On one occasion the channel was blocked by a bar of sudd which actually measured 25 miles along the channel, while within a distance of 150 miles were three more growths aggregating no less than 60 miles. A fleet of vessels especially equipped and a large force of men were working continually for nearly six months before an opening large enough for the smallest river steamer could be made through the mass.

In studying the growth the investigators have found that it is more rapid under certain conditions. For example, it spreads very rapidly after an unusually extensive flood in the upper rivers, which carry down such an amount of sediment and vegetation, while when the rainy season is short the growth is checked considerably, and the current in the upper rivers is usually strong enough to carry out the young vegetation before it becomes dense enough to be able to resist the action of the water.

Since the obstruction of the Nile has such a serious effect in interrupting the transportation between upper and lower Egypt and in cutting off what is really a route between Cairo and Mombasa, the Egyptian government has built a fleet of steamers and barges especially constructed for removing the sudd and retains a large force of men in removing and destroying the vegetation. These vessels are stationed at different points on the Upper Nile, so that they may reach an obstruction without delay.

In clearing the river channel of sudd the engineers have devised several schemes. The top growth frequently becomes so dry that they can burn it over like so much grass. This removes much of the weight of the plants, but they are so matted together that saws are actually used to separate the growth, as it cannot be removed in any other way. The vessels employed for sudd clearing, while light-draft boats, are strongly built and have blunt bows, so that they can be forced against the bank of vegetation. They are provided with steel cables or hawsers, saws, and axes, and carry crews of natives who are experts in working upon the sudd.

The way in which the channel is cleared is as follows: Often the water is so completely hidden that the first difficulty when you are encountered by a barrier of sudd is to discover where in this sudd the river bed runs. This is done by "sounding" through the sudd with long poles. The average depth of water in the sudd may be only a few feet, but when the actual river bed is reached this suddenly increases to a

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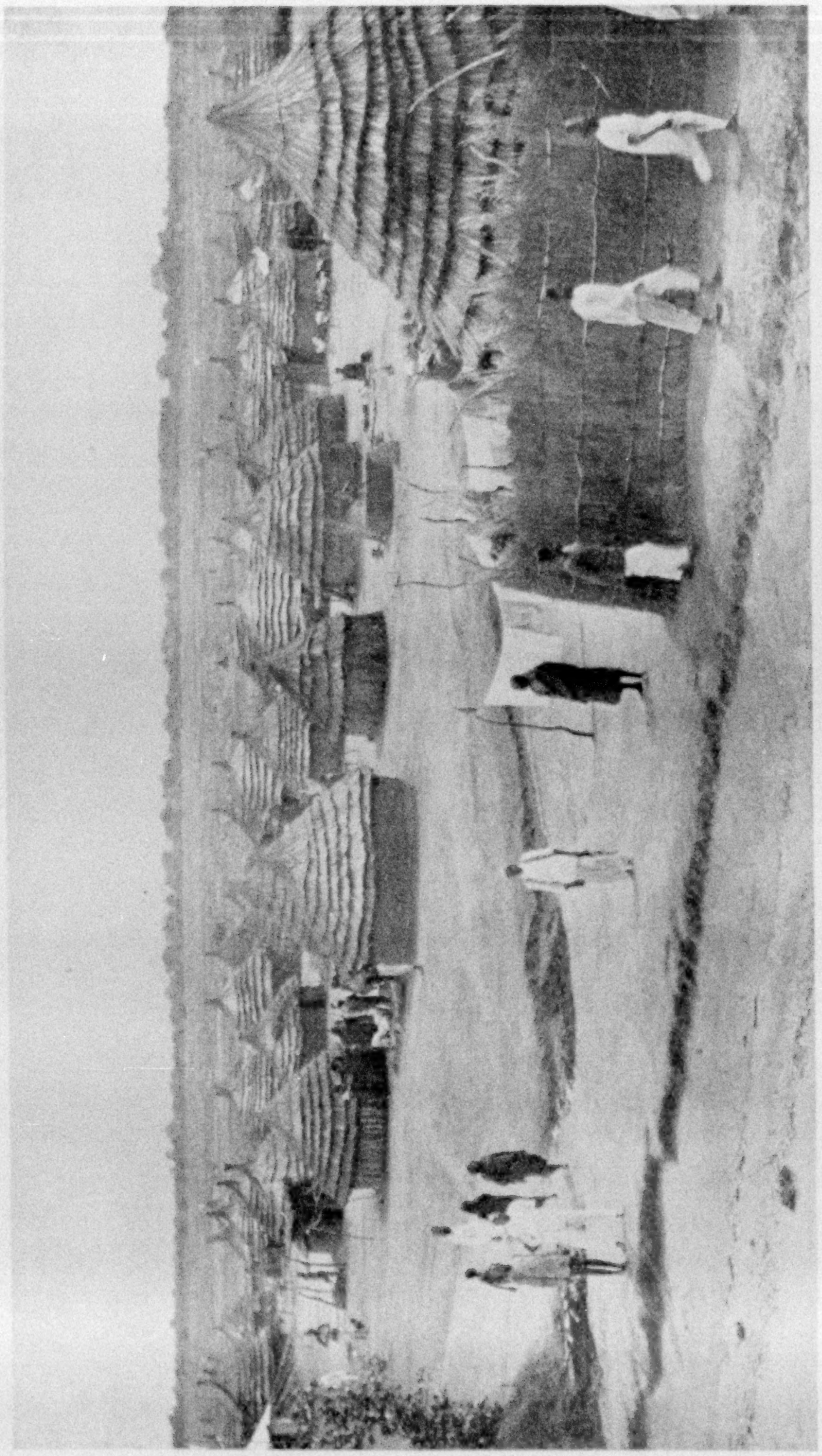
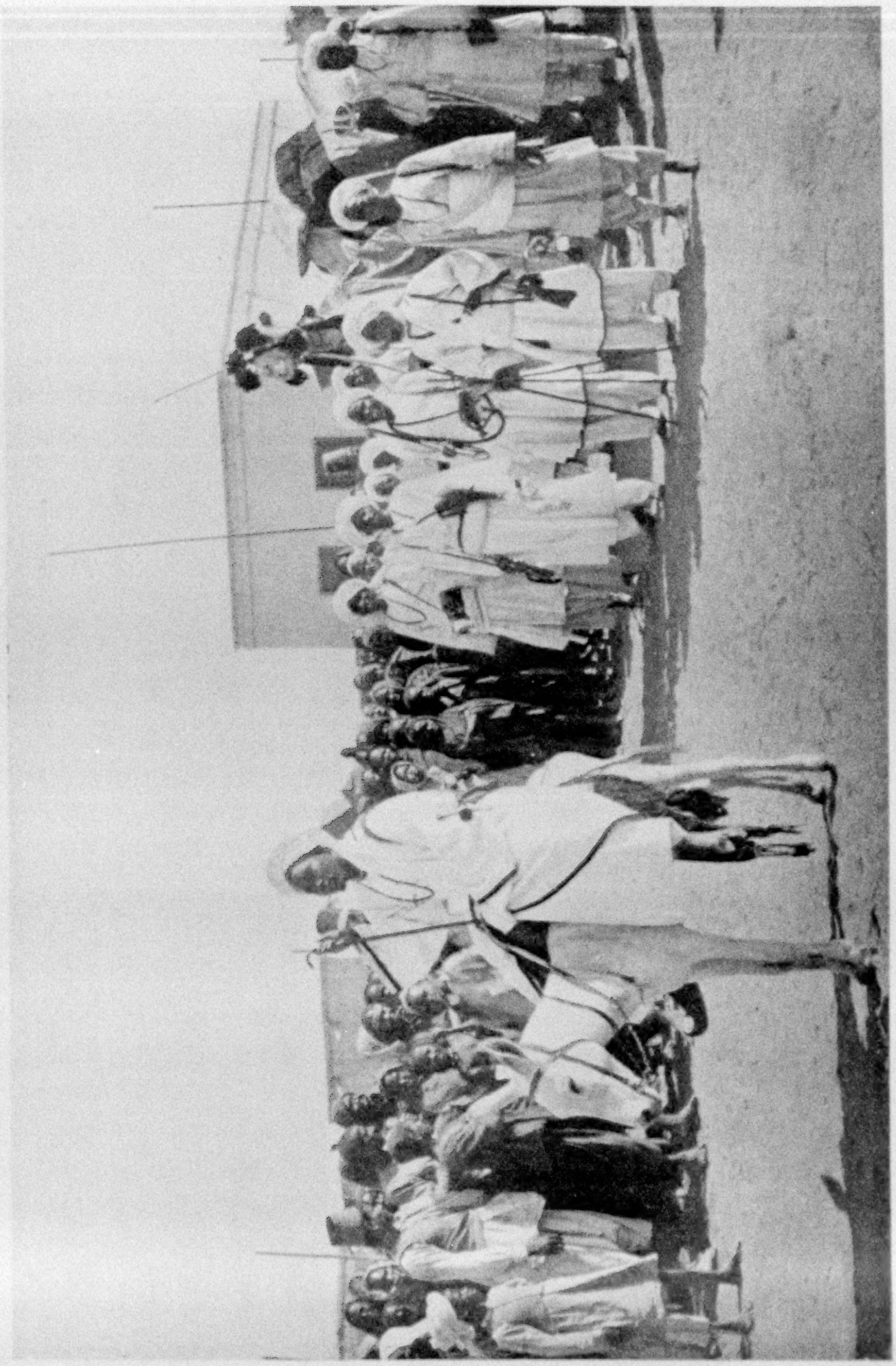
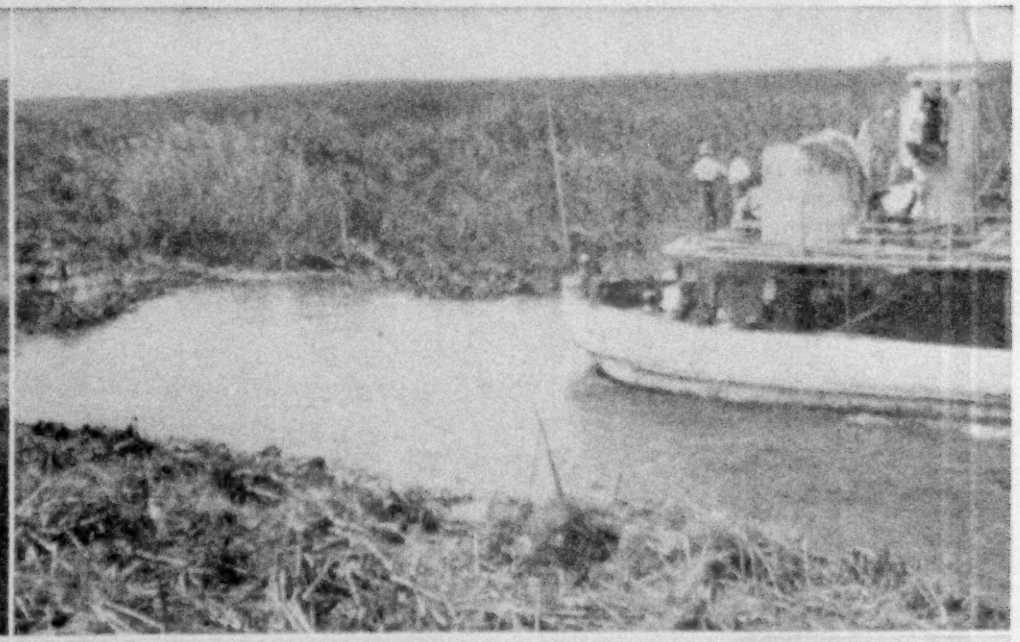


VILLAGE SCENE ON THE NILE NEAR GONDOKORO



SCENE ON THE NILE ABOVE KHARTUM

A SUDD SWAMP ON THE EDGE OF THE NILE, SHOWING THE DENSITY OF THE VEGETATION: CUTTING OFF THE TOP TO DESTROY IT: THE RIVER IS FLOWING BENEATH



SUDD-CLEARING STEAMER TEARING OUT THE OBSTRUCTION WITH STEEL CABLES

HOW SUDD BLOCKS THE NILE CHANNEL: A VIEW OF A BAR OF IT ACROSS THE RIVER, WITH A STEAMER HELD UP

A SUDD ISLAND IN THE CHANNEL, SHOWING HOW IT SUSTAINS WEIGHT ON ACCOUNT OF ITS DENSITY

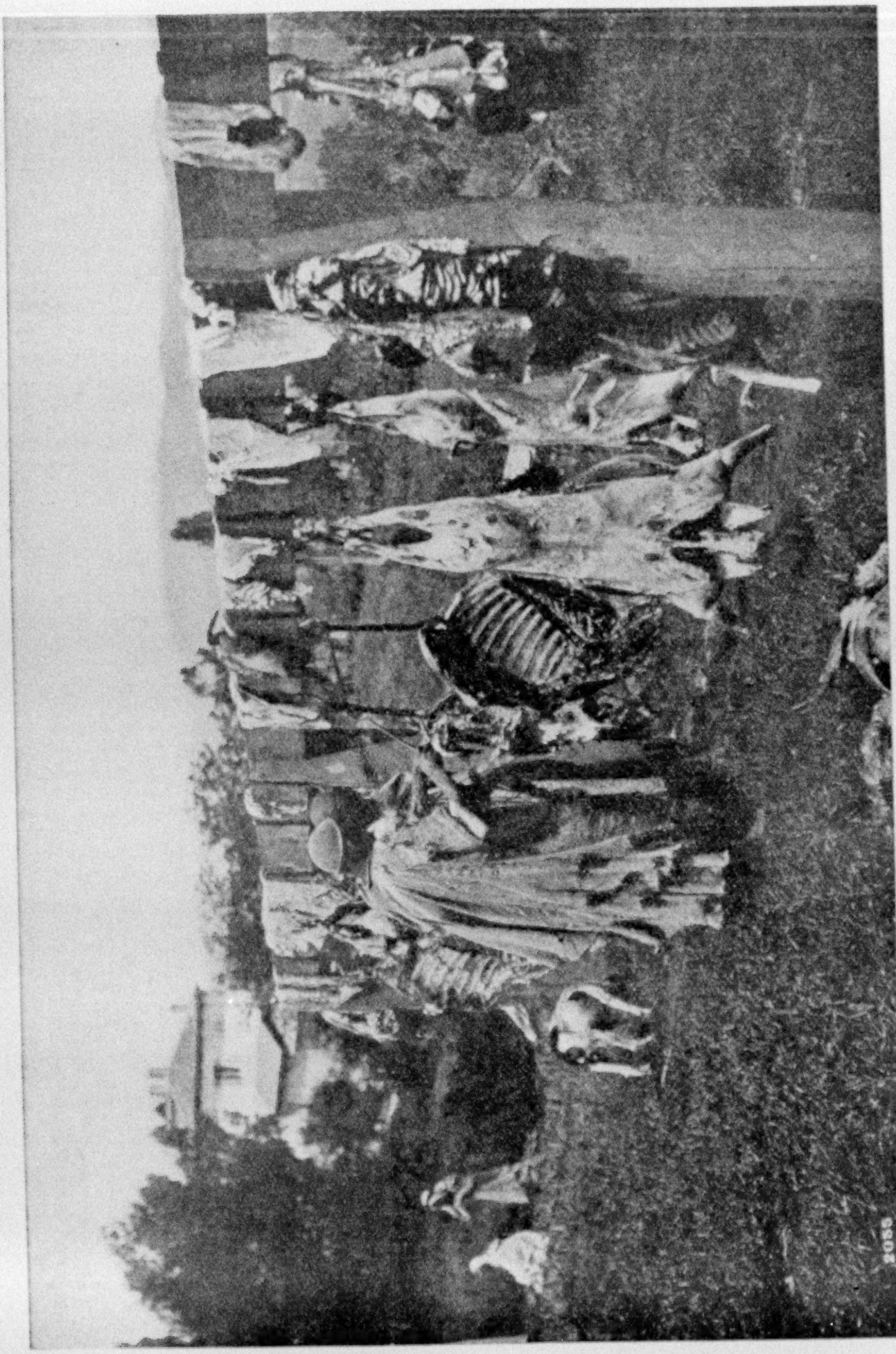
SUDD-CLEANING STEAMER RUN INTO A MASS OF IT TO TEAR OUT THE GROWTH: THE BOW OF THE BOAT CAN BE SEEN IN THE LEFT-HAND CORNER OF THE PICTURE

THE SUDD IS SO DENSE AT TIMES THAT IT IS NECESSARY TO CUT OFF THE TOP GROWTH OR BURN IT OFF BEFORE PULLING THE MASS APART

SUDD-CLEARING STEAMER TEARING OUT THE OBSTRUCTION WITH STEEL CABLES

THE TOP OF A SUDD GROWTH REMOVED AND READY TO BE PULLED TO PIECES TO CLEAR THE CHANNEL

TOWING OUT A MASS OF THE GROWTH FROM THE CHANNEL



A MARKET SCENE IN NORTH AFRICA

Photo from Bishop J. C. Hartzell

A GIRL OF NORTH AFRICA Photo from Bishop J. C. Hartzell

depth of 15 to 18 or 20 feet. Having found the real river bed, the first thing to do is to cut down or burn the top growth, consisting mostly of papyrus.

Having cleared the top of the sudd "block," the men are landed with large saws to cut along the true river bank, which may be either submerged with a few feet of water over it and papyrus and sudd on it, or solid ground with ant heaps, the solid ground never being of any great extent and always surrounded by swamp. Cross and parallel cuts with the saws are then made through the sudd, dividing it into blocks of a convenient size for the steamer to tear out, the size of these blocks, of course, depending on the consistency of the sudd and the power of the steamer.

Having cut the sudd into convenient blocks, the bow of the steamer is run into the block, a loop of steel hawser is placed around it, when the rods of the cable are passed over the bows of the steamer. Here it is taken by the men on board and placed in what is called the trench cut, and held down with their feet. The steamer then goes full speed astern, the men all standing on the hawser to keep it in position. In the case of tough sudd, as many as twenty trials may have to be made before the block of sudd eventually tears away.

When the block is torn out, the steamer goes slowly astern till the mass is pulled clear into the current, if there is one, when it is cast adrift to float downstream, where it is gradually disintegrated. If there is no current, it is towed to a piece of open water, where as a temporary measure it can be tied by ropes to the bank, leaving a wide enough channel for the steamer, and on the appearance of a current to be cut adrift to float downstream.

While the composition of the sudd is usually the water papyrus, it is mixed with what is called elephant grass—a kind of bamboo growing to a height of 20 feet or more. To these climbs a creeper of a kind of convolvulus. Another portion of the sudd consists of ambatch and a long sword grass that cuts like a knife.

Strange as it may seem, the sudd interferes but little with the flow of the river, and the Nile passes under it with little resistance. This is because the growth is principally near or on the surface. As the river is over a mile wide in some places and the deep channel may be only a hundred feet, it is often hard to tell where to find the channel to clear it, as all of the water may be hidden.

The density of the vegetation even in deep water is remarkable. Again referring to the photographs, these show how the men can walk over it without sinking into the mass, such is its tenacity and strength. Animals such as the rhinoceros have been seen crossing the Nile upon this great water carpet, which is woven as deftly and strongly as by the loom.

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LIEUT. SIR ERNEST H. SHACKLETON, who will spend April and May in the United States lecturing, will address the National Geographic Society March 26. President Taft will attend, and at the conclusion of the lecture, on behalf of the National Geographic Society, will present to Lieutenant Shackleton the Hubbard Gold Medal of the Society, which was awarded him some time since for his important explorations in the South Polar regions in 1908-1909.

March 4.—"A New Era for the South." Dr Charles W. Stiles. The speaker will describe the methods by which science and money hope to eradicate the hookworm, or "lazygerm."

March 11.—"The Waste of Human Life and Resources in the Mining Industry." Mr Joseph A. Holmes, of the U. S. Geological Survey. Dr Holmes will tell of the Government's efforts to stem the tide of fatalities, in which the United States leads the world at a ratio of three to one, and the Government's effort to devise ways of saving the great waste, not only of human life, but of our coal, gas, and other mineral resources. Illustrated.

March 18.—"The Panama Canal." Colonel George W. Goethals, Chief Engineer of the Panama Canal. Illustrated.

March 25.—"The Spirit of the West." Mr C. J. Blanchard, of the U. S. Reclamation Service. The wonderful agricultural development of the West since the work of irrigation was started by the Government and private enterprise. Illustrated and moving pictures.

March 26.—"Nearest the South Pole." Lieut. E. H Shackleton. Illustrated.

April 1.—"Patagonia to Paraguay—or the Story of Argentine." Mrs Harriet Chalmers Adams. Illustrated.

April 8.—"The Pearl Fisheries of Ceylon." Dr Hugh M. Smith, Deputy Commissioner, U. S. Bureau of Fisheries. Illustrated.

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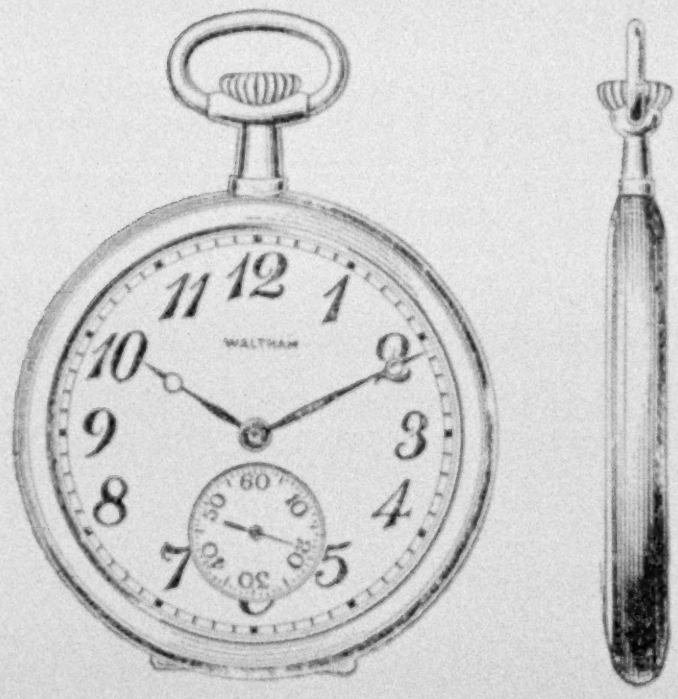

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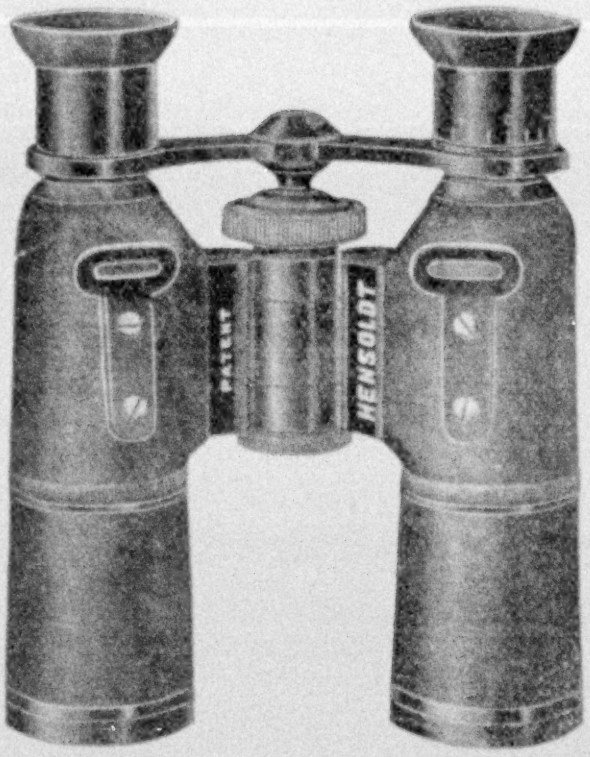

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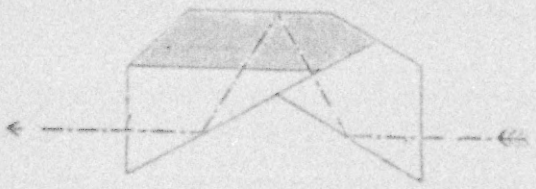

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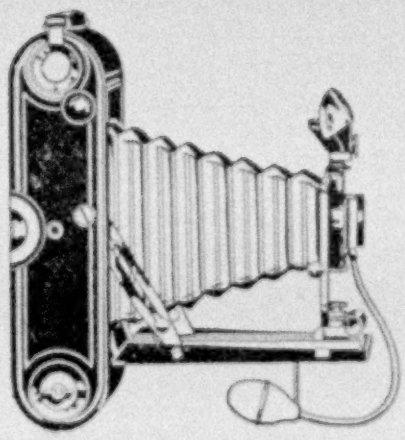

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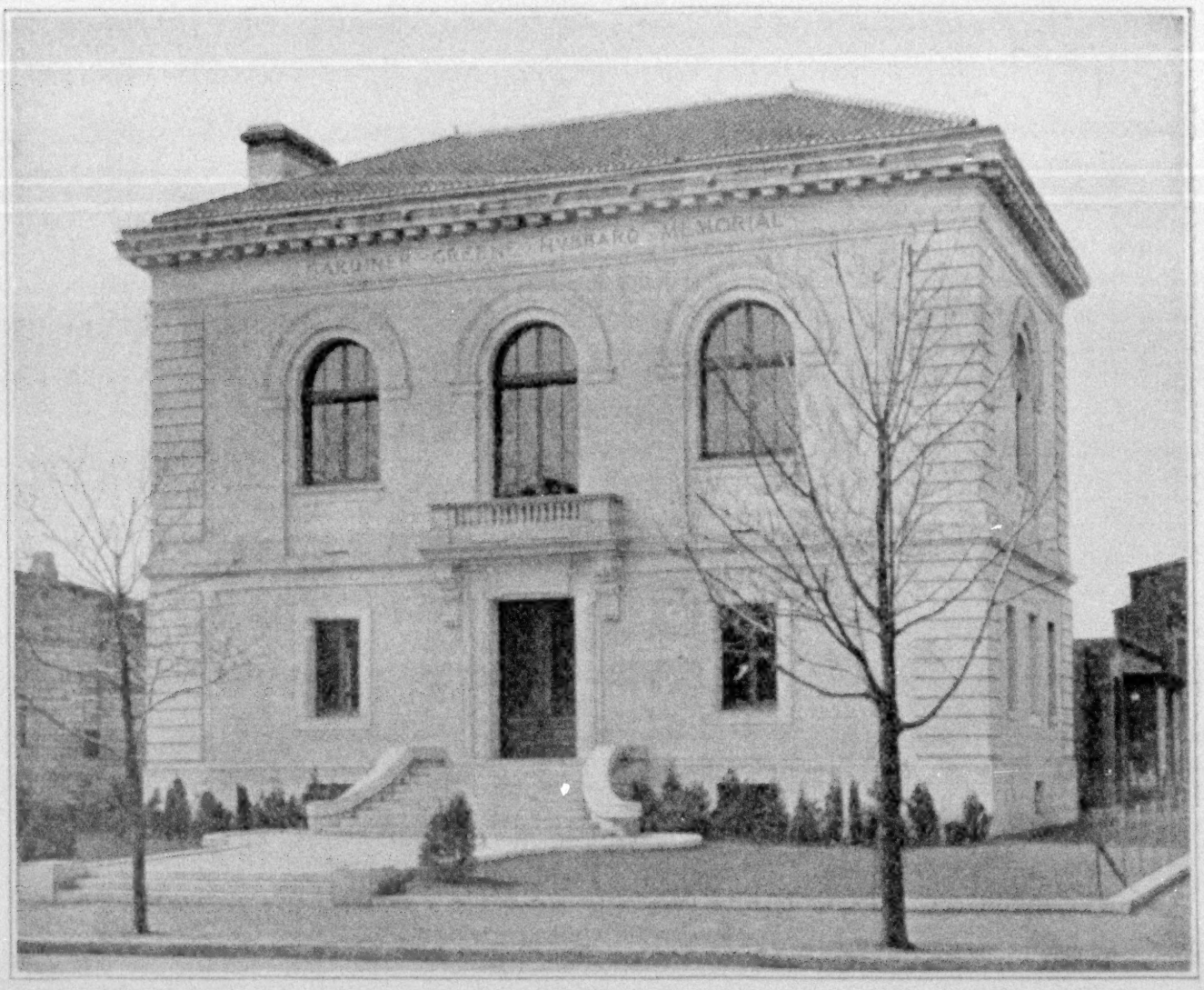

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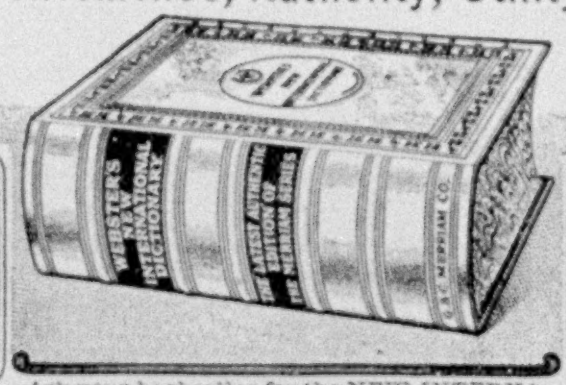

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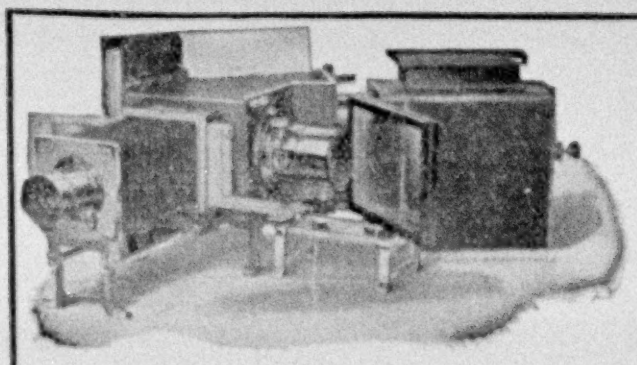

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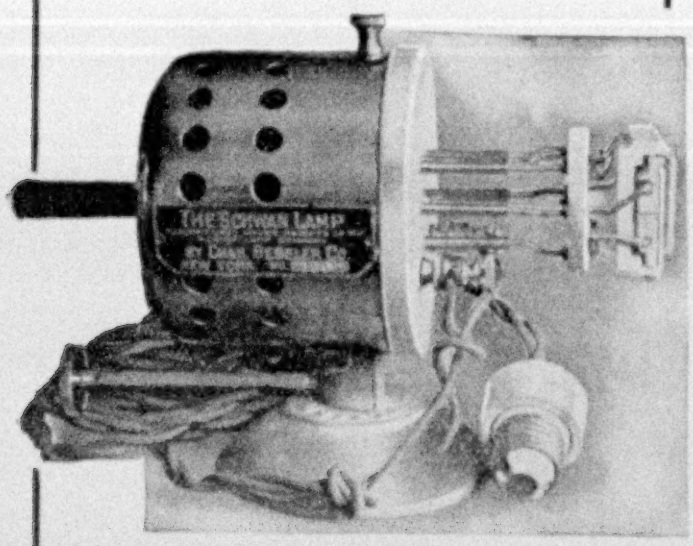

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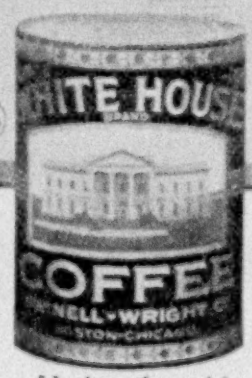

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